

**August 2015**

# **Reformulation Cost Model**

**Contract No. HHSF-223-2011-10005B, Task Order 20**

## **Final Report**

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RTI Project Number 0212926.020.000



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# 1

# Introduction

The FDA Reformulation Cost Model estimates the costs to food manufacturers of reformulating foods based on user selections of product categories, types of reformulation, compliance period, and other inputs.

Many of the food safety and nutrition regulations proposed by the Food and Drug Administration (FDA) require reformulation of affected products or encourage manufacturers to reformulate because of changes in labeling requirements. FDA is required to analyze the costs and benefits of proposed regulations prior to implementation. The Reformulation Cost Model provides a tool to estimate the costs of reformulating products in response to FDA regulation. The model originally developed in 2002 for this purpose required updates and modifications to improve the structure of the model and the cost data incorporated into the model.

The 2014 FDA Reformulation Cost Model accounts for variations in food product complexity, company size, reformulation types and activities, and compliance periods. The cost estimates and model equations were developed based on information obtained during two expert panel meetings conducted in November 2013 and May 2014. The model is programmed in Microsoft Excel 2010 with a Visual Basic interface that steps the user through the selection of the model inputs.<sup>1</sup> The model outputs are provided in an Excel spreadsheet, allowing users to easily tailor the results for each specific use.

In this section, we describe the background and purpose of the model, describe how the 2014 model differs from the 2002 model, and present the structure for the remainder of the report.

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## 1.1 BACKGROUND AND PURPOSE

Under Executive Order 12866 and Executive Order 13563, FDA is required to assess the costs and benefits of regulatory alternatives for proposed rules affecting the food industry.

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<sup>1</sup> The model also operates in Excel 2007.

Regulations that restrict or ban specific ingredients or allow or require specific labeling statements may cause food manufacturers to reformulate foods. In some cases, reformulation is a voluntary response to a labeling requirement as food manufacturers seek to improve the nutritional content of foods (e.g., to lower fat, sodium, or sugar). To assess the economic impacts of regulations that may cause food manufacturers to reformulate foods, FDA requires a method to estimate the costs to industry of the activities involved in reformulation.

In the combined Preliminary Regulatory Impact Analysis (PRIA) for the revision of the nutrition and supplement facts labels and serving sizes, FDA includes the costs of reformulating food products in response to the proposed rules. Food manufacturers may reformulate foods because the proposed rules change the eligibility of products currently making health or nutrient content claims on their labels and also increase the visibility of nutrients that consumers should limit.<sup>2</sup> For example, food manufacturers would be required to list added sugars on the Nutrition Facts Panel (NFP) and thus choose to reformulate foods to reduce added sugars.

Previous estimates of the costs of proposed regulations that may cause food manufacturers to reformulate foods were based on the 2002 version of the Reformulation Cost Model. However, the data and underlying assumptions of the previous model have become outdated. The purpose of this project was to develop a new version of the Reformulation Cost Model using an in-depth process to redesign the structure of the model and using up-to-date data sources (including the same product category data as used in the FDA Labeling Cost Model). The new Reformulation Cost Model, in conjunction with the FDA Labeling Cost Model, can be used to assess the costs of the upcoming changes to the NFP and serving sizes on foods and to estimate the costs of other potential rules.

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<sup>2</sup> Food and Drug Administration (FDA). (2014). Nutrition Facts/Serving Sizes Combined PRIA. Retrieved from <http://www.fda.gov/downloads/food/guidanceregulation/guidancedocumentsregulatoryinformation/labelingnutrition/ucm385669.pdf>



## 1.2 DIFFERENCES BETWEEN 2014 AND 2002 MODELS

In this section, we outline briefly the key differences in the 2014 version of the Reformulation Cost Model compared with the 2002 version. The 2014 model has an improved structure and uses updated data, as described below.

### 1.2.1 Improvements in Model Structure and Assumptions

The Reformulation Cost Model accounts for differences in costs of reformulation across company sizes and complexity of reformulation across food categories.

- In the new model, cost estimates vary by size of the manufacturing company to account for the fact that larger companies put substantially more effort into reformulation than smaller companies. (The previous model had one set of cost estimates across all manufacturer sizes and likely overstated the costs for the vast majority of products.)
- In the new model, cost estimates also vary by the complexity of reformulation for each product category to account for the fact that some products are more easily reformulated (e.g., based on whether it is shelf-stable, refrigerated, or frozen and low acid, acidified, or acid). (The previous model had one set of cost estimates across all product categories and therefore provided less accurate estimates depending on the selected category.)
- Based on input from product formulation experts, the new model assumes that reformulation due to regulation cannot be coordinated with a routine or planned reformulation. (The previous model assumed that a portion of reformulations could be coordinated with planned changes and therefore understated costs by assuming that additional costs would not be incurred for these products.)
- The steps in the reformulation process are better defined for estimating costs of each step based on an in-depth, two-phased expert panel approach with seven experts who previously oversaw product reformulation at major food manufacturing companies or provide formulation consulting services to small and large food manufacturers. (The previous model based the steps on information from a textbook on food product development, but these steps were not vetted.)
- The new model uses a revised, shorter list of analytical and consumer tests that are conducted when products are reformulated and that varies by size of manufacturer. (The previous model included a longer list of tests than is likely typical and assumed the same list

for all manufacturer sizes and therefore overstated this component of costs.)

### 1.2.2 Improvements in Data Used in Model

The model uses 2012 scanner data and cost estimates obtained in 2014.

- The scanner data used to estimate numbers of Universal Product Codes (UPCs), number of unique product formulas, and unit sales are updated to 2012. (The previous model used data for 1999.)
- The estimated costs of reformulation for the new model were developed in 2014 using an expert panel approach across the dimensions mentioned above. (The previous model used cost data obtained primarily from one industry expert in 2002.)
- The wage rate estimates in the new model are delineated by type of reformulation activity and use FDA's current approach to accounting for benefits and overhead and are updated to 2014.

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## 1.3 ORGANIZATION OF THIS REPORT

The remaining sections of the report are as follows:

- Section 2 provides a conceptual overview of the model and the underlying assumptions.
- Section 3 describes the model inputs and outputs, calculations, and data.
- Section 4 provides instructions on operating the model.

In addition, Appendix A provides materials used in the second expert panel during which we obtained labor and other costs for reformulation, Appendix B provides tables of product categories, and Appendix C provides the UPC and formula counts using an alternative size definition for small versus medium companies. A supplementary cost spreadsheet provided to FDA includes additional details regarding the assumptions underlying the cost estimates obtained from the expert panel.

# 2

## Conceptual Overview of the Model and Model Assumptions

The cost estimates shown in Section 3 are based on the conceptual overview of the model presented in this section.

In this section, we provide a conceptual overview of the Reformulation Cost Model and describe the assumptions underlying the model. In response to regulation, food manufacturers may choose whether to reformulate a product, relabel a product, or both. They will assess supply-side, demand-side, and market-structure factors in determining a response.<sup>3</sup> Specifically, they will consider costs of reformulating the product, ongoing costs associated with a change in the production process or use of specific ingredients, anticipated effects on consumer demand for the product, and competitor responses to the regulation.

In contrast to labeling changes, reformulation of products in response to regulation rarely can be coordinated with a planned change that manufacturers would undertake as part of normal operations. Food manufacturers often reformulate foods to improve foods for marketing reasons, to adjust to changes in ingredient availability, or to reduce costs of production. However, based on discussions during two expert panel meetings on the costs of reformulation, food product reformulation is not conducted on a periodic basis in the same way that food product labels are updated on a periodic basis.

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<sup>3</sup> Muth, M. K., S. A. Karns, D. W. Anderson, M. C. Coglaiti, and M. S. Fanjoy. (2003). *Modeling the decision to reformulate foods and cosmetics*. Research Triangle Park, NC: RTI International.

## **2.1 OVERVIEW OF THE REFORMULATION COST MODEL STRUCTURE**

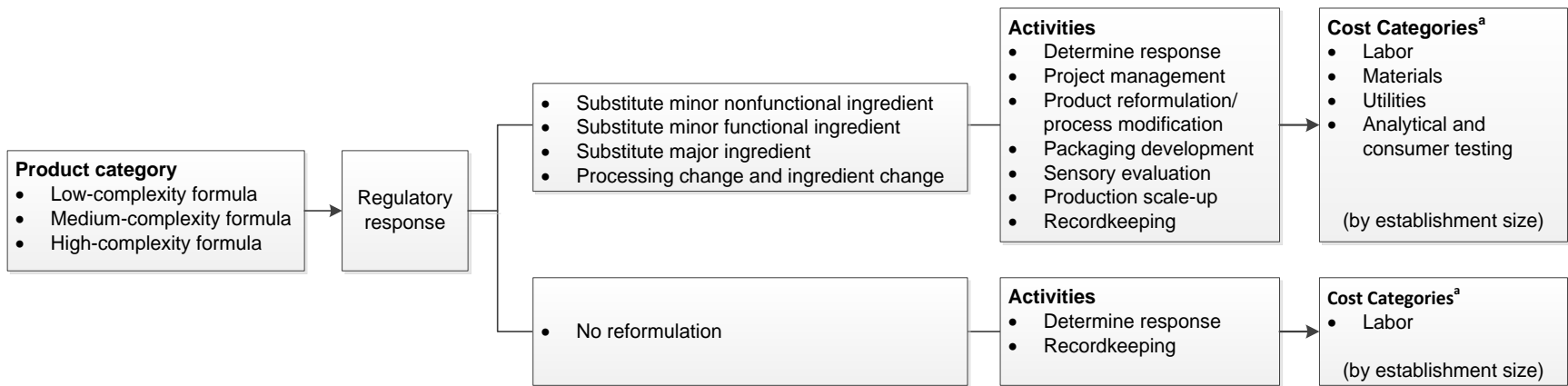
Figure 2-1 provides an overview of the Reformulation Cost Model's structure. Food products have different levels of formulation complexity, which can influence how a food manufacturer responds to a proposed regulation. Based on the requirements of the regulation, food manufacturers might choose not to reformulate the product or choose to conduct a reformulation that would generally fall into one of four categories depending on whether an affected ingredient is a minor nonfunctional, minor functional, or major ingredient and whether a production process change is required. Regardless of whether a food manufacturer reformulates a food in response to a regulation, it will incur some labor costs associated with reviewing the regulation and determining a response and with updating its records. If a food manufacturer does reformulate a food, it will incur labor, materials, and other costs associated with several other activities in the process. The level of effort associated with reformulation generally varies by company size: larger companies invest substantially greater time and resources.

### **2.1.1 Food Classification Based on Reformulation Complexity**

To classify food categories into a reformulation complexity level, we first worked with the expert panels to assign each Nielsen product category into the nine types shown in Table 2-1. Specifically, they determined whether foods in each category are generally shelf-stable, refrigerated, or frozen and acidified, acid, or low acid.

In addition, each food category was deemed either complex or simple based on the number of ingredients and number of production process steps. Complex foods have many ingredients, are technologically challenging, or have interactions among ingredients, whereas simple foods have few ingredients, are technologically straightforward, or are minimally processed (e.g., fresh produce). Foods with a Standard of Identity (SOI) have federally set requirements for what they must contain in order to be sold in interstate commerce (21 CFR 130-169). Because of this, foods with an SOI have limited ability for reformulation and were thus categorized as simple.

Figure 2-1. Overview of the Reformulation Cost Model Structure



<sup>a</sup>Costs are higher for shorter compliance periods because of overtime and rush charges.

Note: Capital equipment costs associated with reformulation will be estimated based on the specific regulation and therefore not are included in the model.

**Table 2-1. Food Type Categories for Estimating Reformulation Costs**

Category Number	Food Type
1	Shelf-stable, acidified food
2	Shelf-stable, acid food
3	Shelf-stable, low-acid food
4	Refrigerated, acidified food
5	Refrigerated, acid food
6	Refrigerated, low-acid food
7	Frozen, acidified food
8	Frozen, acid food
9	Frozen, low-acid food

The expert panel categorized each of the food types in Table 2-1 based on the relative complexity of reformulation shown in Table 2-2. Products with higher complexity of reformulation are generally more difficult to reformulate; thus, costs of labor, materials, and other resources are higher. Each food category in the model was then assigned to one of the three levels so that different levels of costs of reformulation could be attributed to each.

**Table 2-2. Relative Product Formulation Complexity Categorization**

Low-Complexity Formulation	Medium-Complexity Formulation	High-Complexity Formulation
<ul style="list-style-type: none"> <li>Any food with SOI (lowest cost)</li> <li>Acidified, shelf-stable, simple food (Category 1)</li> <li>Acid food, shelf-stable, simple (Category 2)</li> <li>Acidified, frozen, simple food (Category 7)</li> </ul>	<ul style="list-style-type: none"> <li>Low-acid food, shelf-stable, simple food (Category 3)</li> <li>Acidified, refrigerated, simple food (Category 4)</li> <li>Acid, refrigerated, simple food (Category 5)</li> <li>Acid, frozen, simple food (Category 8)</li> </ul>	<ul style="list-style-type: none"> <li>Any complex food (Categories 1–9)</li> <li>Low-acid, refrigerated, simple food (Category 6)</li> <li>Low-acid, frozen, simple food (Category 9)</li> </ul>

### 2.1.2 Types of Reformulation

The costs of reformulation also vary by the extent of the reformulation, which relates to whether an affected ingredient is a minor nonfunctional, minor, or major ingredient and whether a production process change is also required.<sup>4</sup> The ingredient types are defined as follows:

- **Minor nonfunctional ingredient**—used at low levels with limited functional performance effects (e.g., processing aid; carrier for colors, flavors, and intense sweeteners; or anticaking agent)
- **Minor functional ingredient**—used at low levels with functional or food safety effects (e.g., micro-component or less than 2% by weight based on ingredient labeling requirement)
- **Major ingredient**—used at high levels with functional, food safety, or both types of effects (e.g., macro-component or more than 2% by weight)

For each food product, food manufacturers will determine a response to the regulation as follows:

- substitution of a minor nonfunctional ingredient
- substitution of a minor functional ingredient
- substitution of a major ingredient
- a change in the production process with an ingredient change

Alternatively, the food manufacturer may decide not to reformulate a product if the regulation does not specifically require a change that involves reformulation. For example, a requirement for labeling that a product contains a specific ingredient may cause some manufacturers to reformulate to avoid the labeling statement, while others will choose to include the labeling statement and not reformulate the product.

### 2.1.3 Reformulation Activities and Cost Types

Once a food manufacturer decides to reformulate a food, it undertakes a number of steps to conduct the reformulation as follows:

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<sup>4</sup> The 2002 Reformulation Cost Model defined the ingredients as noncritical minor, critical minor, and major ingredient. However, based on the expert panel discussions conducted in November 2013, we revised the categories to more accurately define them for the purposes of estimating reformulation costs.

- **Determine response to regulation**—determine business and technical goals and objectives given a reformulation requirement and marketing, cost, and regulatory constraints (e.g., conduct initial meeting, get input from other departments, get internal and external buy-in, and make response decision)
- **Project management**—manage and coordinate the development phase across the manufacturing, packaging, engineering and plant maintenance, purchasing, legal, marketing, warehousing and distribution, and quality control departments
- **Product reformulation/process modification**—develop the new formula, including identifying and screening replacement ingredients and equipment to maintain product quality and the following types of studies:
  - shelf life and quality studies (microbiology, fat, water activity, pH, and brix),
  - safety studies,
  - distribution studies, and
  - storage studies (temperature, ultraviolet, and packaging durability)
- **Packaging assessment and development (applies only in some cases)**—assess (1) compatibility of product and packaging and shelf stability with new formulation and (2) conformance of package and label to regulations; based on this assessment, develop prototype including label changes
- **Product and package performance testing**—determine how a product or packaging will respond to temperature and other conditions, including the same set of studies under product reformulation/process modification
- **Sensory evaluation**—conduct consumer acceptance research such as discrimination tests, descriptive tests, preference and acceptance tests, focus groups, central location tests, in-home testing, and alienation tests with heavy users
- **Analytical testing**—conduct testing for nutrients, pathogens, allergens, or other components
- **Production scale-up**—confirm the ingredient or process change by running a plant trial, beginning start-up, and verifying the production process for



reproducibility of performance and sensory characteristics

In addition to the steps listed above, manufacturers may need to discard unused inventory of raw materials, packaging, and labels. However, if reformulation occurs in response to a regulation, the expert panel members believed that manufacturers would usually have enough time to use the existing inventory of raw materials and packaging stock.

When manufacturers reformulate foods, they would also update their records associated with the product. Thus, they also incur labor costs to update the relevant records such as the following:

- formula management system
- process flow sheet
- ingredient specifications
- results of consumer tests
- label information

In cases where food manufacturers decide not to reformulate a product in response to a regulation, they still incur costs associated with determining a response to the regulation and updating their records. Thus, for the portion of products that are addressed by the regulation but not reformulation, the model includes the labor costs associated with these activities.

To estimate the costs of reformulation for each of the reformulation activities, we worked with the expert panel to determine the typical resources required for the following types of costs:

- **Labor costs**—estimated as the number of hours for each type of worker involved in the reformulation times the average hourly wage with overhead and benefits
- **Materials and utilities costs**—estimated as the number of dollars for resources during plant trials and product scale-up such as energy, water, sample ingredients and packaging, cleaning supplies, loss of saleable product during the process, and outsourced microbial and storage studies
- **Analytical testing costs**—estimated as the number of tests times the cost per test for each type of test, labor costs for preparing samples, and shipping costs to testing laboratories

- **Market testing costs**—estimated as the number of market tests times the cost per test for each type of test

The model provides the option to obtain cost estimates assuming that the breakpoint between small and medium companies is \$10 million instead of \$1 million in annual sales. In a future version of the model, an additional size category could be added to the model.

The level of resources that a company would devote to a reformulation project varies by the size of the company. In particular, larger companies with national brand products invest substantially greater resources in reformulating products than smaller companies. Thus, we estimated resources for each reformulation activity according to the following company size categories:

- Small: <\$1 million in annual sales
- Medium: \$1–500 million in annual sales
- Large: >\$500 million in annual sales

The expert panel believed that these categories delineated the major differences in resources that would be devoted to a reformulation project.

Another factor that affects the costs of reformulation is the time available for the process. Reformulation costs are higher for shorter timelines depending on whether a manufacturer has sufficient personnel available to oversee and implement the changes; is able to identify supply chain sources for ingredients, packaging, and equipment; and needs to conduct research into capital equipment changes (including developing specifications, traveling to equipment manufacturer, installation, and training). Thus, a manufacturer may incur overtime and rush charges for shorter timelines. Longer timelines may allow for efficiencies in scheduling of reformulation activities or combining work activities and reduce the need for overtime labor.

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## 2.2 REFORMULATION COST MODEL ASSUMPTIONS

The costs of reformulation occur on a per-formula basis rather than a per-UPC basis because a product formula may be packaged in several different sizes.

Several assumptions underlie the Reformulation Cost Model based on the model concept described above, which was informed by the expert panel meetings, and the scope of the model as determined in consultation with FDA. The core assumptions underlying the Reformulation Cost Model are as follows:

- Reformulation due to a regulation cannot be coordinated with a planned change; therefore, no adjustments are made for cost savings due to coordination.

- Reformulation costs are incurred on a per-formula basis, and multiple UPCs may have the same formula.
- Estimated costs of reformulation are similar for branded and private-label products and are therefore not estimated separately.
- Reformulation costs differ by company size because smaller companies generally spend fewer total hours and resources on each reformulation activity.
- Baseline costs are based on a minimum of 24 months for reformulation for small and medium companies and a minimum of 36 months for large companies. Costs are adjusted by an escalation factor for shorter compliance period.
- Reformulation costs represented in the model are one-time costs of reformulation. However, manufacturers may incur higher ongoing annual costs, such as for higher ingredient costs.
- Capital equipment expenditures are not included in the model but may need to be estimated for some types of reformulations.
- Discarded inventory for packaging and ingredients may occur for some reformulations; these costs are accounted for in the escalation factors for short compliance periods.
- For the proportion of products that are not reformulated in response to a regulation, some level of costs is incurred for determining the response to the regulation and recordkeeping.
- Cost estimates assume that a moderate number of products are being reformulated at the same time. Some cost savings could occur when reformulating several products at once but are not estimated in the model. However, costs would be much greater if all products in a category had to be reformulated at the same time.

These assumptions are reflected in the model data and equations described in Section 3.



# 3

## Model Inputs and Outputs, Calculations, and Data

In this section, we provide an overview of the model inputs and outputs, present the model calculations and data, and discuss the treatment of uncertainty in the model. The model uses the same product categories as the FDA Labeling Cost Model but is structured differently to account for differences in costs across size of manufacturer. In addition, all costs are based on the number of formulas within a given product category, but the number of UPCs is also provided in the output for the convenience of the user.

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### 3.1 OVERVIEW OF THE MODEL INPUTS AND OUTPUTS

The Reformulation Cost Model inputs include items that are selected from lists and drop-down boxes (e.g., product categories) and fields for entering values (e.g., analytical testing costs if not provided within the model). The model outputs include a summary of the user inputs and the cost estimates generated based on the user inputs. We list the model inputs and outputs below.

#### 3.1.1 Model Inputs

In operating the model, users select or provide the model input as follows:

- Select affected product subcategories by
  - product category based on the Nielsen ScanTrack product modules or

The model gives users the option to save, retrieve, and revise selected sets of model inputs.

- 6-digit North American Industry Classification System (NAICS) codes.
- Indicate what percentage of products within the product subcategories are subject to the regulation.
- Indicate what percentage of products that are subject to the regulation will be reformulated.
- Select the type of reformulation from the following list:
  - substitution of a minor nonfunctional ingredient
  - substitution of a minor functional ingredient
  - substitution of a major ingredient
  - change in the production process with an ingredient change
- Indicate the type of analytical tests that manufacturers are likely to conduct (with default assumptions included in the model).
- Enter a user-provided cost estimate for analytical tests (if applicable) on a per-formula basis.
- Indicate the type of market tests that manufacturers are likely to conduct (with default assumptions included in the model).
- Enter a user-provided cost estimate for market tests (if applicable) on a per-formula basis.
- Indicate whether to include recordkeeping costs (e.g., for updating nonlabel recordkeeping materials) on a per-UPC basis.
- Modify the wage rates used in calculating costs of relabeling activities.
- Indicate whether to use the default size definition for small companies (up to \$1 million in annual sales) or the alternative size definition (up to \$10 million in annual sales).
- Select a compliance period for implementing the regulation (1, 2, or 3 years), which affects cost escalation factors for shorter timelines.
- Specify an inflation factor relative to the stated baseline year of the model so that all costs are adjusted to the current year (users could choose to base the inflation factor on the gross domestic product deflator, consumer price index, or producer price index).

### 3.1.2 Model Outputs

Based on the user inputs, the model will calculate the costs of labeling changes and present the following outputs:

- summary of user-selected inputs
- separate results for products that are reformulated and those that are not as follows:
  - detailed cost estimates for each product category and subcategory and the number of UPCs, formulas, and sales units for branded and private-label products by company size
  - aggregated cost estimates for all selected products by reformulation activity and company size
  - detailed cost estimates for each product category and subcategory by reformulation activity and company size

Note that capital equipment costs are not included in the model and therefore would need to be estimated separately if relevant for a particular regulation.

---

## 3.2 PRODUCT CATEGORY DATA

The product category data in the FDA Reformulation Cost Model are the same as for the FDA Labeling Cost Model, but the Reformulation Cost Model data are further delineated by company size to account for differences in the costs of reformulation by company size.

The categorization of products in the Reformulation Cost Model is the same as the FDA Labeling Cost Model and occurs at three levels as follows:

- FDA product type or 3-digit NAICS code
- product category (based on Nielsen ScanTrack) or 6-digit NAICS code
- product subcategory (based on Nielsen ScanTrack), which includes one or more Nielsen product modules

For each product subcategory, the cost calculations require

- a designation of the level of complexity of a typical product formula and
- estimates of the number of product formulas by company size for branded products and the total number of product formulas for private-label products.

The model also reports estimates of the number of UPCs by company size for each product subcategory for use in additional analyses.

The 2012 Nielsen ScanTrack data used in the model include supermarkets, drug stores, and mass merchandisers and

excludes Wal-Mart sales. Wal-Mart typically has unique UPCs for branded products based on their own specifications. According to Economic Research Service (ERS) data on sales of food at home by type of outlet, 65.8% of food sales were in supermarkets, other grocery, and mass merchandisers, and 91.4% of sales were in retail outlets (excludes home deliveries and direct sales) in 2012.<sup>1</sup> The ratio of all retail sales to sales in the ScanTrack data is  $(91.4/65.8 = 1.4)$ . As with the FDA Labeling Cost Model, we applied this ratio to the UPC counts and formula counts. The ScanTrack data also do not capture sales of foods without UPC codes, such as fresh produce and seafood purchased at the seafood counter, but these foods generally cannot be reformulated.

We used the scanner data to tabulate the numbers of formulas and UPCs for branded products for the following company sizes:

- Small: <\$1 million in annual sales (20,773 companies<sup>2</sup>)
- Medium: \$1–500 million in annual sales (3,141 companies<sup>3</sup>)
- Large: >\$500 million in annual sales (53 companies)

Note that all private-label products are classified in the medium size category in the model.

To conduct these tabulations, we first calculated the total dollar sales estimates for each company in the ScanTrack data to determine its size category. We then assigned the size category code to each individual UPC and subsequently tabulated the number of formulas (with multiple UPCs often represented in a single formula). Because individual UPCs are not identified for private-label products, we were not able to identify company sizes for these products. Instead, we assumed that all private-label manufacturers would incur the same costs as medium-sized companies under the assumption that (1) it is unlikely that small companies would produce private-label products and (2) even if private-label products are produced by large

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<sup>1</sup> See Table 14 on the ERS website: [http://www.ers.usda.gov/data-products/food-expenditures.aspx#.U\\_83JFfco\\_8](http://www.ers.usda.gov/data-products/food-expenditures.aspx#.U_83JFfco_8) (Accessed August 28, 2014).

<sup>2</sup> If \$10 million in annual sales is used as the breakpoint, the number of small companies is 23,107, and the number of medium companies is 807 (i.e., 2,334 companies shift from the medium to small size category).

<sup>3</sup> Note that all private-label UPCs are assigned to the medium size category. The number of companies that produce private-label products cannot be calculated from the Nielsen data because private-label products are aggregated together.



companies, they are likely to invest fewer resources to reformulate private-label products than branded products.

Table 3-1 provides the complete list of food product categories and subcategories included in the model along with the level of formulation complexity, counts of branded formulas and UPCs by company size for branded products, and counts of formulas and UPCs for all private-label products combined. As described in Section 2, the complexity levels were determined during the expert panel meetings and are intended to capture differences in the level of resources required to reformulate foods.

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Baked goods	Bagels/biscuits/buns/muffins/rolls—fresh	311812—Commercial Bakeries	High	1,611	3,686	1,770	8,687	1,521	3,175	1,503	7,609
	Bagels/biscuits/buns/muffins/rolls—frozen	311812—Commercial Bakeries	High	69	213	116	558	66	197	105	517
	Baked goods—remaining—fresh	311812—Commercial Bakeries	High	416	658	52	1,128	389	530	48	968
	Baked goods—remaining—frozen	311812—Commercial Bakeries	High	158	237	59	286	134	206	53	247
	Bread—fresh	311812—Commercial Bakeries	High	3,489	4,941	1,804	9,268	3,231	4,265	1,605	8,236
	Bread—frozen	311812—Commercial Bakeries	High	99	267	62	398	90	247	55	365
	Breading products	311812—Commercial Bakeries	Medium	490	912	421	1,310	472	770	351	943
	Cakes/doughnuts/sweet rolls—fresh	311812—Commercial Bakeries	High	2,519	6,510	1,762	16,399	2,314	4,899	1,340	12,997
	Cakes/doughnuts/sweet rolls—frozen	311813—Frozen Cakes, Pies, & Other Pastries Manufacturing	High	123	132	129	126	115	115	106	111
	Cookies/cones	311821—Cookie & Cracker Manufacturing	Medium	5,024	7,272	2,257	9,054	4,297	5,111	1,599	6,848
	Crackers	311821—Cookie & Cracker Manufacturing	Medium	1,222	1,828	1,189	2,966	1,119	1,587	741	2,409
	Mexican shells/tortillas	311830—Tortilla Manufacturing	Medium	1,057	1,353	529	795	850	1,056	400	625

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Baking Ingredients	Baking mixes	311822—Flour Mixes & Dough Mfg from Purchased Flour	Medium	1,042	1,517	896	1,713	924	1,256	683	1,420
	Baking supplies	311340—Nonchocolate Confectionery Manufacturing	Medium	630	2,370	440	1,844	561	1,813	329	1,493
	Bread/cookie/dough products—frozen	311822—Flour Mixes & Dough Mfg from Purchased Flour	High	111	116	10	103	104	103	10	94
	Dough products—refrigerated	311822—Flour Mixes & Dough Mfg from Purchased Flour	High	169	168	457	1,990	144	152	347	1,612
	Flour/corn meal	311211—Flour Milling	Low	475	803	216	718	394	579	146	538
Beverages	Buttermilk—refrigerated	311511—Fluid Milk Manufacturing	Low	27	270	190	219	22	187	127	151
	Carbonated beverages—low calorie	312111—Soft Drink Manufacturing	Low	270	676	1,571	1,805	196	392	406	712
	Carbonated beverages—regular	312111—Soft Drink Manufacturing	Low	1,877	3,263	3,232	6,597	1,442	1,750	967	3,278
	Cocktail mixes	312111—Soft Drink Manufacturing	Low	629	567	98	105	540	397	71	80
	Coffee—ground	311920—Coffee & Tea Manufacturing	Low	2,035	2,214	1,110	2,470	1,939	2,044	917	2,259
	Coffee—liquid	311920—Coffee & Tea Manufacturing	Low	171	193	87	24	151	146	63	19
	Coffee—soluble	311920—Coffee & Tea Manufacturing	Low	164	238	361	655	130	182	237	472
	Coffee—whole bean	311920—Coffee & Tea Manufacturing	Low	1,043	807	305	794	1,018	752	281	755

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
	Creamers—liquid	311511—Fluid Milk Manufacturing	High	14	42	323	367	13	35	194	234
	Fruit drinks—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Low	11	129	73	752	11	121	67	703
	Fruit drinks—refrigerated	312111—Soft Drink Manufacturing	Medium	139	603	468	437	122	455	306	319
	Fruit drinks—shelf stable	312111—Soft Drink Manufacturing	Low	1,607	2,728	2,290	4,188	1,407	2,013	1,332	3,003
	Fruit juice—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Low	11	90	52	818	11	87	43	755
	Fruit juice—refrigerated	311421—Fruit & Vegetable Canning	Low	332	851	794	1,315	225	552	475	832
	Fruit juice—shelf stable	311421—Fruit & Vegetable Canning	Low	892	2,277	626	3,518	716	1,409	398	2,340
	Fruit punch bases/syrups	311930—Flavoring Syrup & Concentrate Manufacturing	Low	186	141	57	20	147	133	43	16
	Ice	312113—Ice Manufacturing	NA	518	198	43	247	409	118	8	174
	Milk—flavored—refrigerated	311511—Fluid Milk Manufacturing	High	136	831	577	513	111	522	334	321
	Milk—refrigerated	311511—Fluid Milk Manufacturing	Low	621	2,837	1,439	4,326	437	1,193	585	1,956
	Milk—shelf stable	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	Low	69	158	136	487	63	136	70	362
	Milk/creamers—powdered	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	Medium	24	111	106	1,465	22	86	77	1,120

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
	Milk/water—additives	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	Medium	342	519	318	753	335	460	230	654
	Noncarbonated beverages—mixes	311999—All Other Miscellaneous Food Manufacturing	Medium	99	491	543	1,501	95	357	311	1,012
	Shakes/drinks—remaining—nonrefrigerated	312111—Soft Drink Manufacturing	High	132	288	246	143	114	179	105	86
	Shakes/drinks/egg nog—refrigerated	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	High	97	501	353	414	84	365	210	286
	Tea—bags/packaged	311920—Coffee & Tea Manufacturing	Low	1,070	1,666	344	1,095	1,011	1,453	280	975
	Tea—herbal	311920—Coffee & Tea Manufacturing	Medium	1,005	997	241	199	953	913	220	185
	Tea—instant	311920—Coffee & Tea Manufacturing	Medium	98	203	220	747	95	174	166	624
	Tea—liquid	311920—Coffee & Tea Manufacturing	Medium	724	1,680	1,130	611	664	1,198	671	439
	Vegetable juice—shelf stable	311421—Fruit & Vegetable Canning	Low	361	502	288	897	295	371	202	677
	Water—bottled	312112—Bottled Water Manufacturing	NA	1,632	1,634	1,529	3,297	1,212	962	731	1,997
	Water—bottled/caloric	312111—Soft Drink Manufacturing	Low	77	340	220	294	70	184	90	159
	Water—bottled/low calorie	312111—Soft Drink Manufacturing	Low	126	452	237	1,700	111	322	123	1,159
	Wine—nonalcoholic	312130—Wineries	Low	99	188	21	41	95	145	13	33

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Breakfast Foods	Breakfast bars/pastries/powders	311340—Nonchocolate Confectionery Manufacturing	Medium	658	1,008	1,660	3,216	546	703	1,001	1,880
	Breakfasts—frozen	311412—Frozen Specialty Food Manufacturing	High	199	585	360	566	184	540	311	512
	Cereal—hot	311230—Breakfast Cereal Manufacturing	Medium	242	599	293	2,199	231	482	190	1,751
	Cereal—ready to eat	311230—Breakfast Cereal Manufacturing	Medium	430	1,338	1,547	6,331	377	956	686	3,853
	Waffle/pancake/French toast—frozen	311412—Frozen Specialty Food Manufacturing	High	55	253	144	980	52	221	120	854
Candy & gum	Candy—chocolate	311320—Chocolate & Confectionery Mfg from Cacao Beans	Medium	5,259	9,822	4,659	2,220	4,315	6,962	2,394	1,538
	Candy—dietetic	311340—Nonchocolate Confectionery Manufacturing	Medium	563	697	134	122	510	593	94	105
	Candy—nonchocolate	311340—Nonchocolate Confectionery Manufacturing	Medium	7,561	14,996	2,479	6,203	6,576	10,912	1,506	4,707
	Gum—low calorie	311340—Nonchocolate Confectionery Manufacturing	High	150	147	1,141	114	119	89	409	48
	Gum—regular	311340—Nonchocolate Confectionery Manufacturing	Medium	260	778	358	93	237	535	193	65

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Condiments/dips/spreads	Condiments	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Low	735	1,083	307	2,451	673	934	206	2,092
	Dips—refrigerated	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Medium	340	1,064	291	877	299	840	192	689
	Dips—shelf stable	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Medium	372	556	196	354	360	511	161	325
	Extracts	311942—Spice & Extract Manufacturing	Medium	556	569	73	549	475	438	57	444
	Honey	311999—All Other Miscellaneous Food Manufacturing	Low	1,359	537	8	727	1,045	448	8	573
	Jams/jellies	311421—Fruit & Vegetable Canning	Low	1,445	1,257	300	2,719	1,369	1,075	220	2,408
	Jams/spreads—remaining	311421—Fruit & Vegetable Canning	Low	543	440	197	383	512	374	167	341
	Marinades/tenderizers/msg	311942—Spice & Extract Manufacturing	Low	436	523	185	458	407	484	167	424
	Mayonnaise	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Low	87	321	295	1,043	77	248	155	711
	Peanut butter	311911—Roasted Nuts & Peanut Butter Manufacturing	Low	137	251	299	1,814	125	207	148	1,268
	Pepper	311942—Spice & Extract Manufacturing	NA	472	1,046	196	847	433	820	143	689

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Dairy foods	Pickles/olives/relishes	311421—Fruit & Vegetable Canning	Medium	1,950	5,117	581	5,442	1,769	4,090	449	4,367
	Salt	311942—Spice & Extract Manufacturing	NA	554	820	120	1,074	486	647	92	881
	Salt—substitutes	311942—Spice & Extract Manufacturing	High	6	8	3	0	6	8	3	0
	Sandwich spreads/horseradish/sauerkraut—refrig	311421—Fruit & Vegetable Canning	Medium	189	381	21	204	168	305	14	168
	Seasoning—dry	311942—Spice & Extract Manufacturing	Medium	4,997	8,700	1,612	3,484	4,644	7,422	1,275	3,035
	Spices/seasonings—remaining	311942—Spice & Extract Manufacturing	Medium	286	599	161	355	243	489	109	285
	Spreads—refrigerated	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	High	707	924	151	172	654	757	109	147
	Butter	311512—Creamery Butter Manufacturing	Low	216	372	125	641	199	323	94	554
	Cheese—cottage/farmers/ricotta	311511—Fluid Milk Manufacturing	Low	112	766	560	1,308	80	491	356	842
	Cheese—grated/shredded	311513—Cheese Manufacturing	Low	221	1,332	382	3,665	206	1,047	265	2,877
	Cheese—natural	311513—Cheese Manufacturing	Low	745	3,500	682	5,218	647	2,554	454	1,936
	Cheese—processed	311513—Cheese Manufacturing	Low	550	1,921	406	3,214	497	1,547	232	2,542
	Cheese—specialty/imported	311513—Cheese Manufacturing	Low	799	2,493	151	570	697	1,848	90	436
	Cream—refrigerated	311511—Fluid Milk Manufacturing	Low	90	510	346	631	70	308	209	392

(continued)



**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Desserts	Frozen novelties	311520—Ice Cream & Frozen Dessert Manufacturing	High	914	2,068	1,464	2,442	871	1,874	1,302	2,224
	Ice cream	311520—Ice Cream & Frozen Dessert Manufacturing	Low	1,116	3,778	1,946	6,305	1,049	3,170	1,665	5,422
	Ice milk/sherbet/yogurt—frozen	311520—Ice Cream & Frozen Dessert Manufacturing	Low	97	606	269	896	97	522	248	800
	Ice pops—unfrozen	311520—Ice Cream & Frozen Dessert Manufacturing	Low	62	281	14	163	48	169	14	105
	Sour cream	311511—Fluid Milk Manufacturing	Low	83	529	273	842	53	294	130	453
	Whipping cream	311511—Fluid Milk Manufacturing	Low	21	211	160	242	20	134	97	155
	Yogurt—refrigerated	311511—Fluid Milk Manufacturing	Low	413	1,833	1,610	4,849	386	1,514	1,275	3,992
	Yogurt—shakes/drinks—refrigerated	311511—Fluid Milk Manufacturing	High	139	589	155	199	116	421	120	147
	Cheesecake/pies—fresh	311812—Commercial Bakeries	High	563	2,090	241	3,283	470	1,272	214	2,219
	Cheesecake/pies—frozen	311813—Frozen Cakes, Pies, & Other Pastries Manufacturing	High	144	171	321	113	127	132	266	94
	Dessert—RTS single serving	311999—All Other Miscellaneous Food Manufacturing	Medium	126	416	332	1,846	116	360	262	1,558
	Desserts/toppings—frozen	311813—Frozen Cakes, Pies, & Other Pastries Manufacturing	High	353	487	227	683	323	437	174	598

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Dressings & sauces	Gelatin/pudding—mixes—diet	311999—All Other Miscellaneous Food Manufacturing	Medium	15	43	53	422	15	33	35	314
	Gelatin/pudding—mixes—sweetened	311999—All Other Miscellaneous Food Manufacturing	Medium	157	413	171	1,223	147	299	122	937
	Pudding—refrigerated	311999—All Other Miscellaneous Food Manufacturing	High	112	252	227	464	91	195	155	346
	Syrups/toppings—shelf stable	311999—All Other Miscellaneous Food Manufacturing	High	252	580	242	354	238	469	200	299
	Toppings—refrigerated	311999—All Other Miscellaneous Food Manufacturing	High	25	84	121	398	21	71	87	308
	Salad dressing—liquid	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Low	728	1,249	694	1,926	658	950	468	1,498
	Salad dressing—reduced/low calorie	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	High	182	241	134	243	176	217	115	222
	Salad dressing—refrigerated	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	High	213	616	140	140	193	454	108	109
	Salad dressings/toppings—dry	311942—Spice & Extract Manufacturing	Medium	31	201	84	197	28	160	63	156
	Sauce—barbecue	311421—Fruit & Vegetable Canning	Low	1,526	670	169	971	1,376	518	119	826
	Sauce—Mexican	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Medium	1,298	1,271	389	1,465	1,234	1,155	284	1,324

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Eggs	Sauce—spaghetti/marinara	311421—Fruit & Vegetable Canning	Low	897	1,053	375	1,691	844	984	322	1,562
	Sauce/gravy—mixes	311942—Spice & Extract Manufacturing	Medium	634	941	484	1,170	609	837	413	1,056
	Sauce/gravy/glaze	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Medium	3,521	3,660	686	2,094	3,326	3,233	559	1,894
	Vinegar/cooking wine	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Low	550	1,122	88	1,322	462	868	64	1,048
	Eggs—fresh	311999—All Other Miscellaneous Food Manufacturing	NA	724	1,445	172	1,830	626	1,080	108	1,417
Entrees	Combination lunches	311911—Roasted Nuts & Peanut Butter Manufacturing	High	15	130	164	51	15	112	150	45
	Entrees—frozen	311412—Frozen Specialty Food Manufacturing	High	1,879	5,425	2,174	2,720	1,768	4,805	2,017	2,465
	Entrees—refrigerated	311991—Perishable Prepared Food Manufacturing	High	1,342	2,736	521	2,932	1,294	2,418	438	2,646
	Prepared foods—canned/shelf stable	311999—All Other Miscellaneous Food Manufacturing	High	1,714	4,226	654	1,659	1,555	3,577	549	1,428
Fats & oils	Sandwiches—refrigerated/frozen	311999—All Other Miscellaneous Food Manufacturing	High	743	1,378	473	1,913	690	1,236	426	1,733
	Cooking sprays	311225—Fats & Oils Refining & Blending	Medium	48	43	70	514	43	43	50	434
	Lard/shortening	311613—Rendering & Meat Byproduct Processing	High	25	88	28	206	21	44	11	111

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Fruits & vegetables	Margarine/spreads	311225—Fats & Oils Refining & Blending	High	41	214	193	821	36	168	104	565
	Oils—olive/salad/cooking	311225—Fats & Oils Refining & Blending	Low	1,375	2,008	186	2,766	994	1,071	91	1,670
	Beans—canned	311421—Fruit & Vegetable Canning	Medium	295	1,273	228	1,885	252	966	158	1,442
	Beans/peas/lentils/barley—dry	311423—Dried & Dehydrated Food Manufacturing	NA	636	1,481	35	1,928	553	1,067	29	1,477
	Fruit—canned	311421—Fruit & Vegetable Canning	Low	788	1,511	460	6,513	718	1,209	309	4,666
	Fruit—dried	311423—Dried & Dehydrated Food Manufacturing	Medium	1,019	3,213	473	2,131	873	2,436	356	1,659
	Fruit—fresh	111339—Other Noncitrus Fruit Farming	Low	1,389	3,575	2,130	847	1,196	1,959	824	476
	Fruit/fruit salad—refrigerated	311991—Perishable Prepared Food Manufacturing	High	256	1,615	174	908	209	894	109	539
	Fruits—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Medium	179	418	111	1,411	165	381	84	1,253
	Garlic/herbs—fresh	111219—Other Vegetable (except Potato) & Melon Farming	Low	498	1,397	94	277	458	1,116	78	229
	Leafy greens—fresh	111219—Other Vegetable (except Potato) & Melon Farming	Low	87	281	109	68	87	232	67	55
	Potatoes—canned	311421—Fruit & Vegetable Canning	Medium	31	151	17	599	31	123	10	493
	Potatoes—dehydrated	311423—Dried & Dehydrated Food Manufacturing	Medium	46	319	94	757	35	234	64	549

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Infant foods	Potatoes—fresh	111211—Potato Farming	Low	267	895	501	161	248	612	197	101
	Potatoes—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Medium	141	727	284	2,078	139	618	248	1,811
	Tomatoes—canned	311421—Fruit & Vegetable Canning	Low	459	1,029	374	3,083	431	822	262	2,509
	Vegetables—canned	311421—Fruit & Vegetable Canning	Medium	1,050	3,007	415	6,518	962	2,433	277	5,344
	Vegetables—fresh	111219—Other Vegetable (except Potato) & Melon Farming	Low	1,946	5,621	953	1,674	1,770	4,352	521	1,306
	Vegetables—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Medium	260	1,812	454	7,876	238	1,477	391	6,559
	Vegetables—precut salad mix—fresh	311991—Perishable Prepared Food Manufacturing	High	56	414	301	422	46	326	241	168
	Baby food	311422—Specialty Canning	High	113	789	799	421	106	755	690	383
	Infant formulas	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	High	11	7	356	323	11	6	229	106
	Juices—baby	311421—Fruit & Vegetable Canning	Low	0	30	60	3	0	21	45	1
Meat & poultry	Meat—frozen	311612—Meat Processed from Carcasses	High	312	506	15	307	267	384	14	245
	Meat/poultry—canned	311422—Specialty Canning	Medium	546	1,106	1,089	1,437	487	908	809	578
	Poultry—frozen	311615 - Poultry Processing	High	97	286	76	326	88	234	60	271

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Pizza	Pizza—frozen	311412—Frozen Specialty Food Manufacturing	High	620	1,032	707	1,675	571	916	623	1,497
	Pizza—refrigerated	311991—Perishable Prepared Food Manufacturing	High	118	181	6	156	113	154	6	139
Seafood	Fish—frozen	311712—Fresh & Frozen Seafood Processing	High	452	1,247	66	892	395	1,003	55	734
	Seafood—canned	311711—Seafood Canning	Medium	900	2,541	23	855	815	2,021	17	704
	Seafood—refrigerated	311711—Seafood Canning	High	658	1,008	1	187	575	807	1	155
	Seafood—remaining—frozen	311712—Fresh & Frozen Seafood Processing	High	371	547	0	120	340	490	0	108
	Shrimp—frozen	311712—Fresh & Frozen Seafood Processing	High	496	2,167	3	1,279	375	1,187	3	751
Side dishes & starches	Hors d'oeuvres/snacks—frozen	311412—Frozen Specialty Food Manufacturing	High	676	1,294	276	993	631	1,121	214	870
	Pasta/noodles—dry	311823—Dry Pasta Manufacturing	Medium	2,509	3,806	658	4,865	2,373	3,296	497	4,302
	Prepared foods—dry mixes	311823—Dry Pasta Manufacturing	Medium	517	1,069	1,187	2,911	494	972	1,027	2,616
	Prepared foods—remaining—frozen/refrigerated	311412—Frozen Specialty Food Manufacturing	High	1,562	1,977	193	1,544	1,464	1,732	165	1,389
	Ready-made salads	311991—Perishable Prepared Food Manufacturing	High	507	1,802	81	2,446	449	1,307	71	1,870
	Rice—instant/packaged	311212—Rice Milling	Medium	470	1,109	280	1,503	386	788	150	1,069

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Snack foods	Vegetables—formulated/breaded—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	High	22	175	157	315	21	141	147	274
	Nuts—cans/jars	311911—Roasted Nuts & Peanut Butter Manufacturing	Medium	744	2,083	287	3,385	638	1,705	174	2,736
	Nuts—cello wrapped	311911—Roasted Nuts & Peanut Butter Manufacturing	Medium	1,904	3,778	720	1,692	1,673	2,963	459	1,346
	Nuts—unshelled	311911—Roasted Nuts & Peanut Butter Manufacturing	Low	173	375	48	171	132	197	27	102
	Popcorn—unpopped	311999—All Other Miscellaneous Food Manufacturing	Medium	267	271	404	1,589	231	183	167	979
	Snacks—caramel corn/popped popcorn	311919—Other Snack Food Manufacturing	Medium	1,071	1,043	269	238	899	655	141	171
	Snacks—health bars & sticks	311919—Other Snack Food Manufacturing	High	431	842	666	41	389	451	342	13
	Snacks—meat	311612—Meat Processed from Carcasses	Medium	1,419	1,461	162	363	1,302	1,186	143	315
	Snacks—remaining	311919—Other Snack Food Manufacturing	Medium	1,599	2,836	1,308	886	1,452	2,412	827	723
	Snacks—salty	311919—Other Snack Food Manufacturing	Medium	2,585	7,530	4,658	5,163	2,172	5,412	2,464	3,506
	Snacks—trail mixes	311919—Other Snack Food Manufacturing	Medium	631	1,742	182	750	538	1,381	129	600

(continued)

**Table 3-1. Product Category Data for the Reformulation Cost Model: Estimated Number of UPCs and Formulas, 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Soups	Soup—canned	311421—Fruit & Vegetable Canning	High	329	949	1,278	4,446	305	844	1,074	3,867
	Soup—dry	311423—Dried & Dehydrated Food Manufacturing	High	889	1,593	522	552	848	1,384	431	488
Sweeteners	Sugar	311311—Sugarcane Mills	NA	239	524	28	1,274	220	406	22	1,043
	Sugar—substitutes	325199—All Other Basic Organic Chemical Manufacturing	NA	150	316	18	520	116	201	13	353
	Table syrups/molasses	311999—All Other Miscellaneous Food Manufacturing	Low	638	779	203	1,405	522	535	122	1,022



Of the product categories shown, a few product categories cannot typically be reformulated; therefore, estimated costs are assumed to be zero. These product categories are as follows:

- beans/peas/lentils/barley—dry
- eggs—fresh
- ice
- pepper
- salt
- sugar
- sugar—substitutes
- vegetables—fresh
- water—bottled (with no additional ingredients)

In Appendix Table B-1, we provide further detail regarding the specific Nielsen product modules included within each product type, category, and subcategory. The detail regarding the Nielsen product modules can be helpful in determining the appropriate product subcategory for a regulated product. Note that in some cases, Nielsen product modules were split into multiple product subcategories to ensure that products were correctly associated.

In addition, in Appendix Table C-1, we provide a version of Table 3-1 that uses \$10 million in annual sales rather than \$1 million as the breakpoint between small and medium companies. This allows users to determine how much the costs might differ using an alternative size definition.

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### **3.3 EQUATIONS FOR CALCULATING THE COSTS OF REFORMULATION**

In this section, we describe the equations used for calculating the costs of product reformulation in response to FDA regulation. We begin with a description of the core calculations and then describe how the costs are adjusted for short compliance periods and for inflation. We also describe the method for addressing uncertainty in the cost estimates.

#### **3.3.1 Reformulation Cost Calculations**

As noted previously, reformulation costs are incurred on a per-formulation basis, where multiple UPCs may have the same formulation (e.g., for the same product packaged in multiple

package sizes). The components of the costs include labor hours, utilities, and materials for each activity involved in developing and scaling up production of the new formulation and the costs of analytical and market testing. The basic steps in calculating reformulation costs are as follows:

- Calculate a weighted average hourly labor rate for each activity in the reformulation process by company size.
- Multiply the weighted average hourly labor rate by the number of labor hours for each activity in the reformulation process by company size.
- Add the costs of utilities and materials for each activity in the reformulation process by company size.
- Add the costs of analytical testing for each type of reformulation (same across all company sizes).
- Add the costs of market testing for each type of reformulation (for medium and large companies).
- Sum each of the costs above over all activities in the reformulation process by company size to determine the total per-formula costs.
- Multiply the per-formula costs by the number of formulas by company size for branded products and in total for private-label products.

We explain each step in the calculations in more detail below using the notation provided in Table 3-2.

**Table 3-2. List of Variables Used in the Reformulation Cost Model Calculations**

Variable	Description
i	Indexes product category based on Nielsen scanner data (i = 1 to 172)
j	Indexes labor category (j = 1 to 4)
k	Indexes company size (k = 1 to 3)
r	Indexes reformulation type (r = 1 to 4)
a	Indexes reformulation activity (a = 1 to 8)
c	Indexes reformulation complexity (c = 1 to 3)
f	Cumulative inflation factor relative to 2014 (f = 0.5 to 10.0)
$X_i$	Total number of UPCs in product category i
$Y_i$	Total number of formulas in product category i
$\alpha_i$	Proportion of affected UPCs and formulas in product category i (incur all costs of reformulation)

(continued)

**Table 3-2. List of Variables Used in the Reformulation Cost Model Calculations (continued)**

Variable	Description
$\beta_i$	Proportion of “unaffected” UPCs and formulas in product category i (incur administrative and recordkeeping costs only)
$UPC_{i,k}^B$	Number of branded UPCs in product category i for company size k
$UPC_i^{PL}$	Number of private-label UPCs in product category i (no distinction by company size)
$FORM_{i,k}^B$	Number of branded formulas in product category i for company size k
$FORM_i^{PL}$	Number of private-label formulas in product category i (no distinction by company size)
$WR_j$	Wage rate for labor category j
$W_k^a$	Weighted average wage rate for company size k for reformulation activity a
$\rho_{j,k}^a$	Proportion of labor hours for labor category j by company size k for reformulation activity a
$LH_{i,k}^{r,a}$	Number of labor hours by company size k for reformulation type r and reformulation activity a for product category i
$UM_{i,k}^{r,a}$	Cost estimates for utilities and materials by company size k for reformulation type r and reformulation activity a for product category i
$\tau_r$	Proportion of products that requires packaging development (reformulation activity a = 5) for reformulation type r
$ATC^r$	Analytical testing for reformulation type r
$MTC_k^r$	Consumer (or market) testing for reformulation type r and company size k

To calculate costs of reformulation for product category i, we first calculate a weighted average wage rate for reformulation activity a by company size k:

$$W_k^a = \sum_{j=1}^4 \rho_{j,k}^a \cdot WR_j \quad (3.1)$$

using the Bureau of Labor Statistics (BLS) wage rates and the percentage allocations of hours shown in Table 3-3. This calculation combines the wage rates across different activities required for each type of reformulation because the hours required for food scientists and technologists, business and financial operations, production occupations, and management occupations vary by the stage of the reformulation activity.

**Table 3-3. Allocation of Labor Hours across Reformulation Activities by Company Size**

	<b>Small Company (&lt;1\$ million in sales)</b>	<b>Medium Company (\$1–500 million in sales)</b>	<b>Large Company (&gt;\$500 million in sales)</b>
<b>Activity 1. Determine response to regulation</b>			
Food Scientists and Technologists	0%	20%	40%
Business and Financial Operations	0%	5%	10%
Production Occupations	0%	5%	10%
Management Occupations	100%	70%	40%
<b>Activity 2. Project management</b>			
Food Scientists and Technologists	0%	24%	45%
Business and Financial Operations	0%	5%	10%
Production Occupations	10%	8%	15%
Management Occupations	90%	63%	30%
<b>Activity 3. Product reformulation/process modification</b>			
Food Scientists and Technologists	60%	57%	60%
Business and Financial Operations	0%	0%	0%
Production Occupations	20%	29%	30%
Management Occupations	20%	14%	10%
<b>Activity 4. Packaging assessment</b>			
Food Scientists and Technologists	0%	60%	85%
Business and Financial Operations	0%	0%	0%
Production Occupations	20%	10%	10%
Management Occupations	80%	30%	5%
<b>Activity 5. Packaging development (if needed)</b>			
Food Scientists and Technologists	0%	60%	60%
Business and Financial Operations	0%	0%	5%
Production Occupations	20%	20%	25%
Management Occupations	80%	20%	10%
<b>Activity 6. Product and package performance testing</b>			
Food Scientists and Technologists	80%	86%	90%
Business and Financial Operations	0%	0%	5%

(continued)

**Table 3-3. Allocation of Labor Hours across Reformulation Activities by Company Size (continued)**

	<b>Small Company (&lt;1\$ million in sales)</b>	<b>Medium Company (\$1–500 million in sales)</b>	<b>Large Company (&gt;\$500 million in sales)</b>
Production Occupations	0%	0%	0%
Management Occupations	20%	14%	5%
<b>Activity 7. Production scale-up</b>			
Food Scientists and Technologists	0%	45%	50%
Business and Financial Operations	0%	0%	0%
Production Occupations	80%	45%	45%
Management Occupations	20%	10%	5%
<b>Activity 8. Recordkeeping</b>			
Food Scientists and Technologists	0%	45%	50%
Business and Financial Operations	0%	0%	5%
Production Occupations	50%	45%	35%
Management Occupations	50%	10%	10%

Source: Expert panel estimates developed in May 2014.

Then, we calculate the per-formula labor, utilities, and materials costs of reformulation for **affected products** (i.e., subject to the regulation and reformulated in response to the regulation) in product category  $i$  for reformulation type  $r$  and company size  $k$  as follows:

$$\sum_{a=1}^8 (W_k^a \cdot LH_{i,k}^{r,a} + UM_{i,k}^{r,a}). \quad (3.2)$$

The costs of labor, utilities, and materials for packaging development ( $a=5$ ) are included only for the proportion of products that require packaging development based on the type of reformulation. The proportions are assumed to be the same across company sizes as follows:

- substitution of a minor nonfunctional ingredient ( $\tau_1 = 0\%$ )
- substitution of a minor function ingredient ( $\tau_2 = 5\%$ )
- substitution of a major ingredient ( $\tau_3 = 8\%$ )

- change in production process and an ingredient change ( $\tau_4 = 8\%$ )

Thus, the numbers of affected formulas are multiplied by these proportions before calculating the costs associated with packaging development.

For unaffected products (i.e., subject to the regulation but not reformulated), no utilities and materials costs apply and only two reformulation activities (Activity 1. Determine response to regulation and Activity 8. Recordkeeping) apply. Thus, the per-formula labor costs of reformulation for unaffected products in product category  $i$  for reformulation type  $r$  and company size  $k$  can be calculated as follows:

$$W_k^1 \cdot LH_{i,k}^{r,1} + W_k^8 \cdot LH_{i,k}^{r,8}. \quad (3.3)$$

In addition to the core costs, analytical testing and market testing costs are also included for some types of reformulation for affected products. Default analytical testing costs assumptions are shown in Table 3-4 and apply to all food types (low, medium, and high complexity of reformulation) and all company sizes.

**Table 3-4. Default Analytical Testing Cost Assumptions for Product Reformulation**

Type of Reformulation	Types and Numbers of Tests
1. Substitution of a minor nonfunctional ingredient	<ul style="list-style-type: none"> <li>▪ None</li> </ul>
2. Substitution of a minor functional ingredient	<ul style="list-style-type: none"> <li>▪ NFP using a database (1 test)</li> </ul>
3. Substitution of a major ingredient	<ul style="list-style-type: none"> <li>▪ NFP using a database (1 test)</li> <li>▪ Allergen testing (4 tests)</li> <li>▪ pH, Brix, and Aw (4 tests)</li> </ul>
4. Change in production process and an ingredient change	<ul style="list-style-type: none"> <li>▪ NFP using a database (1 test)</li> <li>▪ Allergen testing (4 tests)</li> <li>▪ pH, Brix, and Aw (4 tests)</li> </ul>

Source: Expert panel assumptions developed in May 2014.

With the exception of the NFP, which is conducted once, we assumed that manufacturers would test four times per formula over two separate rounds of testing; incur 1 hour of labor costs to select, prepare, and ship the samples for each round; and incur shipping costs of \$75.35 for each round (based on the 2014 FedEx charge for 2 pound overnight package sent for

8:00 am delivery, 301 to 600 miles distance). Note that if users select additional analytical tests, the model assumes the test will be conducted 4 times—2 times during the development phase and 2 times after the reformulation project is completed.

Default market testing cost assumptions are shown in Table 3-4 and apply to all food types (low, medium, and high complexity). Based on information from the expert panel, small companies would not generally conduct systematic market testing and therefore are excluded from the table. In addition to the tests shown, some of the larger companies may conduct alienation tests to determine if heavy users of the product would respond negatively to the change. These tests are currently not accounted for in the model due to lack of data on the costs and frequency of use.

Note that if users select additional market tests, including focus groups, which are not shown in Table 3-5, the model assumes that a company would conduct one set of each type of test.

**Table 3-5. Default Market Testing Cost Assumptions for Product Reformulation**

Type of Reformulation	Types and Numbers of Tests	
	Medium Size Company	Large Size Company
1. Substitution of a minor nonfunctional ingredient	▪ None	▪ None
2. Substitution of a minor functional ingredient	▪ Discrimination (1 set)	▪ Descriptive (2 sets)
3. Substitution of a major ingredient	▪ Discrimination (1 set)	▪ Discrimination (1 set)
	▪ Central location test (1 set)	▪ Descriptive (2 sets)
		▪ Central location test (3 sets)
4. Change in production process and an ingredient change		▪ In-home test (5 sets)
	▪ Discrimination (1 set)	▪ Discrimination (1 set)
	▪ Central location test (1 set)	▪ Descriptive (2 sets)
		▪ Central location test (3 sets)
		▪ In-home test (5 sets)

Source: Expert panel assumptions developed in May 2014.

Summing over all of the costs of reformulation for **affected products** in product category i for reformulation type r and company size k is calculated as:

$$\sum_{a=1}^8 (W_k^a \cdot LH_{i,k}^{r,a} + UM_{i,k}^{r,a}) + ATC^r + MTC_k^r. \quad (3.4)$$

Recall that activity a=5 only applies to a portion of products, as noted above.

Likewise, the costs of reformulation for **unaffected products** in product category i for reformulation type r and company size k is calculated as:

$$W_k^1 \cdot LH_{i,k}^{r,1} + W_k^8 \cdot LH_{i,k}^{r,8}. \quad (3.5)$$

For product category i and reformulation type r, we then sum over company size k and affected and unaffected formulas to calculate the cost of reformulation:

$$\begin{aligned} RC_i^r = \sum_{k=1}^3 \left[ \sum_{a=1}^8 \left( (W_k^a \cdot LH_{i,k}^{r,a} + UM_{i,k}^{r,a} + ATC^r + MTC_k^r) \right. \right. \\ \left. \cdot \alpha_i \cdot FORM_{i,k}^B + (W_k^1 \cdot LH_{i,k}^{r,1} + W_k^8 \cdot LH_{i,k}^{r,8}) \cdot \beta_i \right. \\ \left. \cdot FORM_{i,k}^B \right) \Big] \\ + \left( (W_2^a \cdot LH_{i,2}^{r,a} + UM_{i,2}^{r,a} + ATC^r + MTC_2^r) \right. \\ \left. \cdot \alpha_i \cdot FORM_i^{PL} + (W_2^1 \cdot LH_{i,2}^{r,1} + W_2^8 \cdot LH_{i,2}^{r,8}) \cdot \beta_i \right. \\ \left. \cdot FORM_i^B \right) \end{aligned} \quad (3.6)$$

Note that for branded products, costs are differentiated by small, medium, and large companies. For private-label products, the costs for medium companies are applied (represented as k=2).

### 3.3.2 Adjustments for Short Compliance Periods

If the compliance period for a regulation is short, manufacturers will incur increased costs for overtime labor, additional staffing, and rush charges with vendors and suppliers. According to the members of the expert panel, the baseline costs described above are based on a minimum of 24 months for reformulation for small and medium companies and a minimum of 36 months for large companies. The cost escalation factors for shorter compliance periods are as follows:



- For a 12-month compliance period:
  - small company costs increase by 75%
  - medium company costs increase by 125%
  - large company costs increase by 200%
- For a 24-month compliance period, large company costs increase by 50%.

Cost increases are due to additional labor, discarded ingredients, and discarded labels and printed packaging.

These escalation factors apply to all categories of costs in the model for products that will be reformulated, including labor, utilities and materials, analytical testing, and market testing. For products that will not be reformulated and therefore incur only labor costs for administrative activities and recordkeeping, the escalation factors are not applied.

### **3.3.3 Adjustments for Inflation**

Users have the option of indicating an inflation adjustment factor to account for the differences in costs that have occurred between 2014, the base year for the costs, and the year in which the analysis is conducted. Thus, users enter a value for the cumulative inflation rate,  $f$ , relative to 2014. To allow for complete flexibility in using the model,  $r$  is permitted to fall in the range of 0.5 to 10.0. By permitting values less than 1.0, the model allows for the possibility of deflation or for estimating costs for an earlier time period.

Consistent with the labeling cost model, if users enter an inflation factor, all costs in the model are adjusted by the inflation factor. However, in cases where users enter specific dollar estimates, the user-entered estimates are not adjusted by inflation under the assumption that users are entering current dollar estimates. For example, if users alter the wage rates in the model, the labor costs in the model are not adjusted for inflation. In addition, user-entered analytical testing costs or market testing costs are also not adjusted for inflation.

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## **3.4 COST DATA INCLUDED IN THE MODEL**

In this section, we present the cost estimates included in the model and also describe the method for addressing uncertainty in the cost estimates. The estimates were developed through

the expert panel process described in Appendix A supplemented with additional sources such as the BLS for wage rates, commercial laboratories for analytical testing costs, and consumer testing companies for market testing costs.

#### **3.4.1 Labor Hour Estimates**

Table 3-6 presents a summary of the estimated labor hours by type of reformulation, product complexity, reformulation activity, and company size. We used @Risk to regenerate the 5th percentile, mean, and 95th percentile of the estimated labor hours assuming  $\pm 20\%$  of the mean costs and triangular distribution. The wage rates used to calculate the labor costs associated with internal labor hours are shown in Table 3-7. The wage rates are shown for the 10th and 90th rather than 5th and 95th percentiles because the BLS publishes these values as the endpoints.

#### **3.4.2 Utilities and Materials Cost Estimates**

Table 3-8 presents a summary of the estimated costs of utilities and materials by type of reformulation, product complexity, reformulation activity, and company size. We used @Risk to regenerate the 5th percentile, mean, and 95th percentile of the estimated costs assuming  $\pm 20\%$  of the mean costs and triangular distribution.

**Table 3-6. Estimated Labor Hours for Each Reformulation Activity by Complexity of Reformulation and Company Size**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Per-Formula Labor Hours								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Substitution of a minor nonfunctional ingredient—low</b>									
Determine response to regulation	7	8	9	43	50	57	86	100	114
Project management	7	8	9	119	138	157	297	344	391
Product reformulation/process modification	35	40	45	145	168	191	363	420	477
Packaging assessment	3	4	5	23	26	30	57	66	75
Packaging development (if needed)	0	0	0	0	0	0	0	0	0
Product and package performance testing	0	0	0	0	0	0	0	0	0
Production scale-up	7	8	9	138	160	182	345	400	455
Recordkeeping	3	4	5	414	480	546	1,036	1,200	1,364
<b>Substitution of a minor functional ingredient—low</b>									
Determine response to regulation	7	8	9	86	100	114	173	200	227
Project management	14	16	18	237	275	313	594	688	782
Product reformulation/process modification	69	80	91	604	700	796	1,511	1,750	1,989
Packaging assessment	5	6	7	57	66	75	142	165	188
Packaging development (if needed)	5	6	7	345	400	455	863	1,000	1,137
Product and package performance testing	35	40	45	468	542	617	1,170	1,356	1,541
Production scale-up	69	80	91	1,036	1,200	1,364	2,590	3,000	3,410
Recordkeeping	7	8	9	829	960	1,091	2,072	2,400	2,728
<b>Substitution of a major ingredient—low</b>									
Determine response to regulation	7	8	9	129	150	171	259	300	341
Project management	28	32	36	541	627	713	1,354	1,568	1,782
Product reformulation/process modification	138	160	182	5,801	6,720	7,639	14,502	16,800	19,097
Packaging assessment	7	8	9	114	132	150	285	330	375
Packaging development (if needed)	7	8	9	691	800	909	1,726	2,000	2,273
Product and package performance testing	35	40	45	468	542	617	1,170	1,356	1,541
Production scale-up	138	160	182	2,072	2,400	2,728	5,179	6,000	6,820

(continued)

**Table 3-6. Estimated Labor Hours for Each Reformulation Activity by Complexity of Reformulation and Company Size (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Per-Formula Labor Hours								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
Recordkeeping	7	8	9	2,072	2,400	2,728	5,179	6,000	6,820
<b>Change in production process and an ingredient change—low</b>									
Determine response to regulation	7	8	9	173	200	227	345	400	455
Project management	55	64	73	1,119	1,296	1,473	2,797	3,240	3,683
Product reformulation/process modification	414	480	546	11,602	13,440	15,277	29,004	33,600	38,193
Packaging assessment	14	16	18	228	264	300	570	660	750
Packaging development (if needed)	35	40	45	1,036	1,200	1,364	2,590	3,000	3,410
Product and package performance testing	35	40	45	468	542	617	1,171	1,356	1,541
Production scale-up	138	160	182	2,072	2,400	2,728	5,179	6,000	6,820
Recordkeeping	7	8	9	2,072	2,400	2,728	5,179	6,000	6,821
<b>No change—low</b>									
Determine response to regulation	7	8	9	43	50	57	86	100	114
Project management	0	0	0	0	0	0	0	0	0
Product reformulation/process modification	0	0	0	0	0	0	0	0	0
Packaging assessment	0	0	0	0	0	0	0	0	0
Packaging development (if needed)	0	0	0	0	0	0	0	0	0
Product and package performance testing	0	0	0	0	0	0	0	0	0
Production scale-up	0	0	0	0	0	0	0	0	0
Recordkeeping	2	2	2	3	4	5	7	8	9
<b>Substitution of a minor nonfunctional ingredient—medium</b>									
Determine response to regulation	7	8	9	43	50	57	86	100	114
Project management	14	16	18	119	138	157	297	344	391
Product reformulation/process modification	45	52	59	207	240	273	518	600	682
Packaging assessment	3	4	5	23	26	30	57	66	75
Packaging development (if needed)	0	0	0	0	0	0	0	0	0

(continued)

**Table 3-6. Estimated Labor Hours for Each Reformulation Activity by Complexity of Reformulation and Company Size (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Per-Formula Labor Hours								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
Product and package performance testing	0	0	0	0	0	0	0	0	0
Production scale-up	7	8	9	138	160	182	345	400	455
Recordkeeping	3	4	5	414	480	546	1,036	1,200	1,364
<b>Substitution of a minor functional ingredient—medium</b>									
Determine response to regulation	7	8	9	86	100	114	173	200	227
Project management	28	32	36	376	435	494	939	1,088	1,237
Product reformulation/process modification	90	104	118	863	1,000	1,137	2,158	2,500	2,842
Packaging assessment	5	6	7	57	66	75	142	165	188
Packaging development (if needed)	5	6	7	345	400	455	863	1,000	1,137
Product and package performance testing	35	40	45	468	542	617	1,171	1,356	1,541
Production scale-up	69	80	91	1,036	1,200	1,364	2,590	3,000	3,410
Recordkeeping	7	8	9	829	960	1,091	2,072	2,400	2,728
<b>Substitution of a major ingredient—medium</b>									
Determine response to regulation	7	8	9	129	150	171	259	300	341
Project management	55	64	73	817	947	1,076	2,044	2,368	2,692
Product reformulation/process modification	180	208	236	8,287	9,600	10,913	20,718	24,000	27,281
Packaging assessment	7	8	9	114	132	150	285	330	375
Packaging development (if needed)	7	8	9	691	800	909	1,726	2,000	2,273
Product and package performance testing	35	40	45	468	542	617	1,171	1,356	1,541
Production scale-up	138	160	182	2,072	2,400	2,728	5,179	6,000	6,820
Recordkeeping	7	8	9	2,072	2,400	2,728	5,179	6,000	6,820
<b>Change in production process and an ingredient change—medium</b>									
Determine response to regulation	7	8	9	173	200	227	345	400	455
Project management	110	128	145	1,740	2,016	2,292	4,351	5,040	5,729
Product reformulation/process modification	539	624	709	16,574	19,200	21,826	41,434	48,000	54,563

(continued)

**Table 3-6. Estimated Labor Hours for Each Reformulation Activity by Complexity of Reformulation and Company Size (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Per-Formula Labor Hours								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
Packaging assessment	14	16	18	228	264	300	570	660	750
Packaging development (if needed)	35	40	45	1,036	1,200	1,364	2,590	3,000	3,410
Product and package performance testing	35	40	45	468	542	617	1,171	1,356	1,541
Production scale-up	138	160	182	2,072	2,400	2,728	5,179	6,000	6,820
Recordkeeping	7	8	9	2,072	2,400	2,728	5,179	6,000	6,821
<b>No change—medium</b>									
Determine response to regulation	7	8	9	43	50	57	86	100	114
Project management	0	0	0	0	0	0	0	0	0
Product reformulation/process modification	0	0	0	0	0	0	0	0	0
Packaging assessment	0	0	0	0	0	0	0	0	0
Packaging development (if needed)	0	0	0	0	0	0	0	0	0
Product and package performance testing	0	0	0	0	0	0	0	0	0
Production scale-up	0	0	0	0	0	0	0	0	0
Recordkeeping	2	2	2	3	4	5	7	8	9
<b>Substitution of a minor nonfunctional ingredient—high</b>									
Determine response to regulation	7	8	9	43	50	57	86	100	114
Project management	21	24	27	119	138	157	297	344	391
Product reformulation/process modification	90	104	118	207	240	273	518	600	682
Packaging assessment	3	4	5	23	26	30	57	66	75
Packaging development (if needed)	0	0	0	0	0	0	0	0	0
Product and package performance testing	0	0	0	0	0	0	0	0	0
Production scale-up	7	8	9	138	160	182	345	400	455
Recordkeeping	3	4	5	414	480	546	1,036	1,200	1,364
<b>Substitution of a minor functional ingredient—high</b>									
Determine response to regulation	7	8	9	86	100	114	173	200	227

(continued)

**Table 3-6. Estimated Labor Hours for Each Reformulation Activity by Complexity of Reformulation and Company Size (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Per-Formula Labor Hours								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
Project management	41	48	55	376	435	494	939	1,088	1,237
Product reformulation/process modification	180	208	236	863	1,000	1,137	2,158	2,500	2,842
Packaging assessment	5	6	7	57	66	75	142	165	188
Packaging development (if needed)	5	6	7	345	400	455	863	1,000	1,137
Product and package performance testing	35	40	45	468	542	617	1,171	1,356	1,541
Production scale-up	69	80	91	1,036	1,200	1,364	2,590	3,000	3,410
Recordkeeping	7	8	9	829	960	1,091	2,072	2,400	2,728
<b>Substitution of a major ingredient—high</b>									
Determine response to regulation	7	8	9	129	150	171	259	300	341
Project management	83	96	109	1,177	1,363	1,549	2,942	3,408	3,874
Product reformulation/process modification	359	416	473	8,287	9,600	10,912	20,717	24,000	27,282
Packaging assessment	7	8	9	114	132	150	285	330	375
Packaging development (if needed)	7	8	9	691	800	909	1,726	2,000	2,273
Product and package performance testing	35	40	45	468	542	617	1,171	1,356	1,541
Production scale-up	138	160	182	2,072	2,400	2,728	5,179	6,000	6,820
Recordkeeping	7	8	9	2,072	2,400	2,728	5,179	6,000	6,820
<b>Change in production process and an ingredient change—high</b>									
Determine response to regulation	7	8	9	173	200	227	345	400	455
Project management	166	192	218	2,548	2,952	3,356	6,370	7,380	8,389
Product reformulation/process modification	1,077	1,248	1,419	16,574	19,200	21,825	41,434	48,000	54,564
Packaging assessment	14	16	18	228	264	300	570	660	750
Packaging development (if needed)	35	40	45	1,036	1,200	1,364	2,590	3,000	3,410
Product and package performance testing	35	40	45	468	542	617	1,170	1,356	1,541
Production scale-up	138	160	182	2,072	2,400	2,728	5,179	6,000	6,820
Recordkeeping	7	8	9	2,072	2,400	2,728	5,179	6,000	6,820

(continued)

**Table 3-6. Estimated Labor Hours for Each Reformulation Activity by Complexity of Reformulation and Company Size (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Per-Formula Labor Hours								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>No change—high</b>									
Determine response to regulation	7	8	9	43	50	57	86	100	114
Project management	0	0	0	0	0	0	0	0	0
Product reformulation/process modification	0	0	0	0	0	0	0	0	0
Packaging assessment	0	0	0	0	0	0	0	0	0
Packaging development (if needed)	0	0	0	0	0	0	0	0	0
Product and package performance testing	0	0	0	0	0	0	0	0	0
Production scale-up	0	0	0	0	0	0	0	0	0
Recordkeeping	2	2	2	3	4	5	7	8	9

Source: Expert panel estimates obtained May 2014.



**Table 3-7. Wage Rates for Labor Categories Associated with Food Reformulation, 2014**

<b>BLS Labor Category</b>	<b>10th Percentile</b>	<b>Mean</b>	<b>90th Percentile</b>
Food Scientists and Technologists	\$15.73	\$29.97	\$47.96
Business and Financial Operations	\$16.45	\$29.75	\$45.56
Production Occupations	\$8.89	\$14.19	\$21.70
Management Occupations	\$24.38	\$52.77	\$91.45 <sup>a</sup>

Source: BLS downloaded from [http://www.bls.gov/oes/current/naics2\\_31-33.htm](http://www.bls.gov/oes/current/naics2_31-33.htm). Wage rates apply to NAICS code 311 for food manufacturing in May 2014.

<sup>a</sup> The 90th percentage for management occupations in food manufacturing is now suppressed for confidentiality reasons in the BLS data. Therefore we applied a 3% adjustment factor, which is the calculated increase for the mean value, to the 2013 value to estimate the 2014 value.

Note: In the model, these rates are multiplied by 100% to account for benefits and overhead.

**Table 3-8. Estimated Utilities and Materials Costs for Each Reformulation Activity by Complexity of Reformulation and Company**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Costs per Formula								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Substitution of a minor nonfunctional ingredient—low</b>									
Determine response to regulation	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$86	\$100	\$114	\$86	\$100	\$114	\$86	\$100	\$114
Packaging assessment	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Production scale-up	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Substitution of a minor functional ingredient—low</b>									
Determine response to regulation	\$1,036	\$1,200	\$1,364	\$—	\$—	\$—	\$—	\$—	\$—
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$86	\$100	\$114	\$86	\$100	\$114	\$86	\$100	\$114
Packaging assessment	\$86	\$100	\$114	\$86	\$100	\$114	\$86	\$100	\$114
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$1,942	\$2,250	\$2,558	\$1,942	\$2,250	\$2,558	\$—	\$—	\$—
Production scale-up	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Substitution of a major ingredient—low</b>									
Determine response to regulation	\$1,036	\$1,200	\$1,364	\$4,316	\$5,000	\$5,683	\$10,790	\$12,500	\$14,209
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$432	\$500	\$568	\$432	\$500	\$568	\$432	\$500	\$568
Packaging assessment	\$432	\$500	\$568	\$432	\$500	\$568	\$432	\$500	\$568
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$1,942	\$2,250	\$2,558	\$1,942	\$2,250	\$2,558	\$—	\$—	\$—
Production scale-up	\$863	\$1,000	\$1,137	\$4,350	\$5,040	\$5,729	\$10,876	\$12,600	\$14,323

(continued)

**Table 3-8. Estimated Utilities and Materials Costs for Each Reformulation Activity by Complexity of Reformulation and Company (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Costs per Formula								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Change in production process and an ingredient change—low</b>									
Determine response to regulation	\$1,036	\$1,200	\$1,364	\$4,316	\$5,000	\$5,684	\$10,790	\$12,500	\$14,209
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$1,295	\$1,500	\$1,705	\$1,295	\$1,500	\$1,705	\$432	\$500	\$568
Packaging assessment	\$1,295	\$1,500	\$1,705	\$1,295	\$1,500	\$1,705	\$432	\$500	\$568
Packaging development (if needed)	\$8,632	\$10,000	\$11,367	\$8,632	\$10,000	\$11,367	\$43,162	\$50,000	\$56,836
Product and package performance testing	\$1,942	\$2,250	\$2,558	\$1,942	\$2,250	\$2,558	\$—	\$—	\$—
Production scale-up	\$2,590	\$3,000	\$3,410	\$17,264	\$20,000	\$22,734	\$43,162	\$50,000	\$56,838
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>No change—low</b>									
Determine response to regulation	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Packaging assessment	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Production scale-up	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Substitution of a minor nonfunctional ingredient—medium</b>									
Determine response to regulation	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$86	\$100	\$114	\$86	\$100	\$114	\$86	\$100	\$114
Packaging assessment	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—

(continued)

**Table 3-8. Estimated Utilities and Materials Costs for Each Reformulation Activity by Complexity of Reformulation and Company (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Costs per Formula								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
Product and package performance testing	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Production scale-up	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Substitution of a minor functional ingredient—medium</b>									
Determine response to regulation	\$1,036	\$1,200	\$1,364	\$—	\$—	\$—	\$—	\$—	\$—
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$86	\$100	\$114	\$86	\$100	\$114	\$86	\$100	\$114
Packaging assessment	\$86	\$100	\$114	\$86	\$100	\$114	\$86	\$100	\$114
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$1,942	\$2,250	\$2,558	\$1,942	\$2,250	\$2,558	\$—	\$—	\$—
Production scale-up	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Substitution of a major ingredient—medium</b>									
Determine response to regulation	\$1,036	\$1,200	\$1,364	\$4,316	\$5,000	\$5,684	\$10,790	\$12,500	\$14,209
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$432	\$500	\$568	\$432	\$500	\$568	\$432	\$500	\$568
Packaging assessment	\$432	\$500	\$568	\$432	\$500	\$568	\$432	\$500	\$568
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$1,942	\$2,250	\$2,558	\$1,942	\$2,250	\$2,558	\$—	\$—	\$—
Production scale-up	\$1,726	\$2,000	\$2,273	\$8,701	\$10,080	\$11,458	\$1,726	\$2,000	\$2,273
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Change in production process and an ingredient change—medium</b>									
Determine response to regulation	\$1,036	\$1,200	\$1,364	\$4,316	\$5,000	\$5,683	\$10,790	\$12,500	\$14,209
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$2,158	\$2,500	\$2,842	\$2,158	\$2,500	\$2,842	\$432	\$500	\$568

(continued)

**Table 3-8. Estimated Utilities and Materials Costs for Each Reformulation Activity by Complexity of Reformulation and Company (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Costs per Formula								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
Packaging assessment	\$2,158	\$2,500	\$2,842	\$2,158	\$2,500	\$2,842	\$432	\$500	\$568
Packaging development (if needed)	\$17,265	\$20,000	\$22,735	\$17,264	\$20,000	\$22,735	\$43,161	\$50,000	\$56,836
Product and package performance testing	\$1,942	\$2,250	\$2,558	\$1,942	\$2,250	\$2,558	\$—	\$—	\$—
Production scale-up	\$5,179	\$6,000	\$6,820	\$34,528	\$40,000	\$45,469	\$5,179	\$6,000	\$6,820
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>No change—medium</b>									
Determine response to regulation	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Packaging assessment	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Production scale-up	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Substitution of a minor nonfunctional ingredient—high</b>									
Determine response to regulation	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$86	\$100	\$114	\$86	\$100	\$114	\$86	\$100	\$114
Packaging assessment	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Production scale-up	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Substitution of a minor functional ingredient—high</b>									
Determine response to regulation	\$1,036	\$1,200	\$1,364	\$—	\$—	\$—	\$—	\$—	\$—

(continued)

**Table 3-8. Estimated Utilities and Materials Costs for Each Reformulation Activity by Complexity of Reformulation and Company (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Costs per Formula								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$86	\$100	\$114	\$86	\$100	\$114	\$86	\$100	\$114
Packaging assessment	\$86	\$100	\$114	\$86	\$100	\$114	\$86	\$100	\$114
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$1,942	\$2,250	\$2,558	\$1,942	\$2,250	\$2,558	\$—	\$—	\$—
Production scale-up	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Substitution of a major ingredient—high</b>									
Determine response to regulation	\$1,036	\$1,200	\$1,364	\$4,316	\$5,000	\$5,684	\$10,790	\$12,500	\$14,209
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$432	\$500	\$568	\$432	\$500	\$568	\$432	\$500	\$568
Packaging assessment	\$432	\$500	\$568	\$432	\$500	\$568	\$432	\$500	\$568
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$1,942	\$2,250	\$2,558	\$1,942	\$2,250	\$2,558	\$—	\$—	\$—
Production scale-up	\$1,726	\$2,000	\$2,273	\$8,701	\$10,080	\$11,458	\$21,754	\$25,200	\$28,645
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
<b>Change in production process and an ingredient change—high</b>									
Determine response to regulation	\$1,036	\$1,200	\$1,364	\$4,316	\$5,000	\$5,684	\$10,790	\$12,500	\$14,209
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$3,021	\$3,500	\$3,979	\$3,021	\$3,500	\$3,978	\$432	\$500	\$568
Packaging assessment	\$3,021	\$3,500	\$3,979	\$3,021	\$3,500	\$3,979	\$432	\$500	\$568
Packaging development (if needed)	\$25,897	\$30,000	\$34,102	\$25,897	\$30,000	\$34,102	\$86,321	\$100,000	\$113,669
Product and package performance testing	\$1,942	\$2,250	\$2,558	\$1,942	\$2,250	\$2,558	\$—	\$—	\$—
Production scale-up	\$5,179	\$6,000	\$6,820	\$34,528	\$40,000	\$45,469	\$86,320	\$100,000	\$113,670
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—

(continued)

**Table 3-8. Estimated Utilities and Materials Costs for Each Reformulation Activity by Complexity of Reformulation and Company (continued)**

Type of Reformulation— Complexity (low/medium/high): Reformulation Activity	Costs per Formula								
	Small Company			Medium Company			Large Company		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>No change—high</b>									
Determine response to regulation	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Project management	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product reformulation/process modification	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Packaging assessment	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Packaging development (if needed)	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Product and package performance testing	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Production scale-up	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—
Recordkeeping	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—	\$—

Source: Expert panel estimates obtained May 2014.

### 3.4.3 Analytical and Market Testing Costs

The analytical testing and market testing cost estimates included in the Reformulation Cost Model are the same as those in the Labeling Cost Model.

Table 3-9 shows estimated analytical testing costs for a list of common tests, and Table 3-10 shows estimated market testing costs for focus groups and quantitative tests. In both tables, the low estimates correspond to the 5th percentiles and the high estimates correspond to the 95th percentiles of the probability ranges, assuming a triangular distribution. Estimated analytical testing costs were based on published prices from testing laboratories,<sup>1</sup> and estimated market testing costs were based on information provided by vendors. For both types of tests, users have the option of including additional testing costs other than the specific selections in the model.

In developing the costs of analytical tests, we assumed the following:

- Two samples per formula are tested at two separate times during the reformulation process.
- Labor costs to prepare samples each time are estimated by assuming 1 hour of labor for a production worker.
- Testing the samples requires shipping one 2-pound package overnight by FedEx at a cost of \$75.35 (based on the assumption of 8:00 am delivery and a shipment distance of 301 to 600 miles).

Thus, the total cost per sample is four times the cost per test shown in Table 3-9 plus two times the cost of labor and shipping. However, the exception is the use of a nutrition database for the NFP. In this case, testing costs are estimated as one test with no labor or shipping costs.

We developed estimates of the market testing costs shown in Table 3-10 using information provided by three companies that

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<sup>1</sup> Analytical test costs were obtained from The National Food Lab, Midwest Laboratories, Microbac Laboratories, Inc., Medallion Labs, RL Food Testing Laboratory, EMSL Food Testing, Nutrilabel, NutriData, Food Lab, Shakti BioResearch, Celplor, LLC, CGIBD Advanced Analytics Core, Barrow-Agee Laboratories, LLC, Great Lakes Scientific, Inc., Litchfield Analytical Services, and BioProfile Testing Laboratories. To combine these estimates, we first discarded outlier values. Then we identified the minimum and maximum values from the range of estimates. We calculated the “most likely” value as an average of the remaining values. If we had only two estimates (minimum and maximum), we calculated the midpoint and used this as the “most likely” value.



**Table 3-9. Estimated Analytical Testing Costs in the Reformulation Cost Model, 2014 (\$/Formula)**

Type of Test	5th Percentile	Mean	95th Percentile
Food—NFP based on laboratory test	742	845	968
Food—NFP based on database	111	188	262
Food—fat composition	122	168	208
Food—trans fatty acids	122	172	225
Food—sugar profile	87	104	122
Food—total fiber	132	194	265
Food—soluble or insoluble fiber	155	212	272
Food—vitamins	93	169	257
Food—vitamin D	179	243	309
Food—minerals	23	42	64
Food—iodine	55	107	170
Food—potassium	22	40	63
Food—sodium chloride	19	29	37
Food—pH, brix, Aw	13	20	27
Food—proximate analysis	66	108	161
Food—pathogens	34	77	126
Food—caffeine	74	102	128
Food—acrylamide	216	227	239
Food—allergens	85	125	175
Food—bioengineered ingredients	147	276	414

Note: The total test costs included in the model assumes two rounds of testing with two tests each round in addition to 1 hour of labor to prepare the samples, and \$75.35 for overnight shipment to the testing lab.

**Table 3-10. Estimated Market Testing Costs in the Reformulation Cost Model, 2014 (\$/Formula)**

Type of Test	5th Percentile	Mean	95th Percentile
Focus groups	6,158	6,500	6,842
Discrimination test	4,973	6,300	7,784
Descriptive test	8,594	13,058	16,534
Central location test	24,733	31,950	39,162
In-home test	21,776	27,350	32,922

conduct a variety of studies for manufacturers. The key assumptions underlying these estimates are as follows:

- Focus groups—three groups with 8 to 10 consumers each, 3 products per group, 1.5 hours per group
- Discrimination test—one location with 30 to 100 consumers and 1 to 3 products per test
- Descriptive test—one location with 12 to 100 consumers and 3 to 4 products per test
- Central location test—3 to 5 locations with 100 consumers per location and 3 to 5 products per test
- In-home test—5 locations with 100 consumers per location (or distributed across a broader area through direct shipment) and 5 products per test

When multiple products are included in a test, we divided the costs for the entire test by the number of products to determine a per-formula cost for use in the model. An additional test that may be conducted for major national brands is an alienation test with frequent users of the products. However, estimates of the costs of this test and the information on the scenarios in which these tests would be run were not available.

#### **3.4.4 Total Per-Formula Costs of Reformulation by Reformulation Activity**

Using the estimated labor hours, wage rates, utilities and materials costs, analytical testing costs, and market testing costs in the formulas presented in Section 3.3, the model calculates per-formula reformulation costs for each reformulation activity. Tables 3-11, 3-12, and 3-13 show the resulting ranges of per-formula costs by reformulation activity for low-, medium-, and high-complexity foods based on (1) type of reformulation and (2) company size.

**Table 3-11. Per-Formula Costs by Reformulation Activity and Company Size for Low-Complexity Foods**

Substitution of a Minor Nonfunctional Ingredient	Small Companies			Medium Companies			Large Companies			Total		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
1. Determine response to regulation	\$341	\$844	\$1,646	\$1,847	\$4,513	\$8,775	\$3,196	\$7,498	\$14,248	\$1,492	\$3,632	\$7,043
2. Project management	\$320	\$783	\$1,521	\$4,919	\$11,885	\$22,966	\$10,318	\$23,681	\$44,441	\$3,912	\$9,381	\$18,051
3. Product reformulation/process modification	\$1,212	\$2,610	\$4,740	\$4,423	\$9,705	\$17,852	\$10,646	\$23,213	\$42,500	\$3,864	\$8,456	\$15,526
4. Packaging assessment	\$128	\$360	\$775	\$811	\$1,832	\$3,503	\$1,765	\$3,898	\$7,127	\$670	\$1,530	\$2,930
5. Packaging development	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6. Product and package performance testing	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
7. Production scale-up testing	\$168	\$350	\$642	\$3,730	\$8,048	\$14,738	\$9,029	\$19,208	\$34,871	\$3,016	\$6,487	\$11,862
8. Recordkeeping	\$100	\$268	\$566	\$11,190	\$24,144	\$44,215	\$29,495	\$64,116	\$117,304	\$9,073	\$19,619	\$35,944
Analytical tests	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Consumer tests	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$2,269	\$5,215	\$9,890	\$26,920	\$60,127	\$112,049	\$64,449	\$141,614	\$260,491	\$22,028	\$49,105	\$91,357

Substitution of a Minor Functional Ingredient	Small Companies			Medium Companies			Large Companies			Total		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
1. Determine response to regulation	\$1,377	\$2,044	\$3,010	\$3,695	\$9,026	\$17,549	\$6,429	\$14,996	\$28,370	\$3,188	\$7,366	\$13,997
2. Project management	\$639	\$1,565	\$3,041	\$9,798	\$23,683	\$45,786	\$20,636	\$47,362	\$88,882	\$7,797	\$18,704	\$36,007
3. Product reformulation/process modification	\$2,306	\$5,120	\$9,470	\$18,152	\$40,119	\$74,039	\$44,041	\$96,403	\$176,857	\$15,111	\$33,350	\$61,491
4. Packaging assessment	\$299	\$641	\$1,199	\$2,097	\$4,750	\$8,871	\$4,482	\$9,845	\$17,978	\$1,719	\$3,866	\$7,197
5. Packaging development	\$11	\$27	\$54	\$555	\$1,255	\$2,339	\$1,288	\$2,830	\$5,188	\$441	\$994	\$1,848
6. Product and package performance testing	\$3,164	\$5,012	\$7,657	\$17,798	\$38,195	\$69,256	\$37,908	\$84,343	\$154,146	\$14,766	\$31,352	\$56,507
7. Production scale-up testing	\$1,655	\$3,505	\$6,488	\$28,003	\$60,360	\$110,457	\$67,780	\$144,060	\$261,342	\$22,754	\$48,908	\$89,387
8. Recordkeeping	\$233	\$536	\$1,018	\$22,408	\$48,288	\$88,349	\$58,990	\$128,232	\$234,608	\$18,174	\$39,238	\$71,802
Analytical tests	\$111	\$188	\$262	\$111	\$188	\$262	\$111	\$188	\$262	\$111	\$188	\$262
Consumer tests	\$0	\$0	\$0	\$4,973	\$6,300	\$7,784	\$17,188	\$26,116	\$33,068	\$4,260	\$5,652	\$7,031
Total	\$9,795	\$18,638	\$32,199	\$107,590	\$232,164	\$424,692	\$258,853	\$554,375	\$1,000,701	\$88,322	\$189,619	\$345,529

(continued)

**Table 3-11. Per-Formula Costs by Reformulation Activity and Company Size for Low-Complexity Foods (continued)**

Substitution of a Major Ingredient	Small Companies			Medium Companies			Large Companies			Total		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Reformulation Activity</b>												
1. Determine response to regulation	\$1,377	\$2,044	\$3,010	\$9,858	\$18,539	\$32,007	\$20,414	\$34,994	\$56,827	\$8,036	\$14,755	\$25,113
2. Project management	\$1,278	\$3,130	\$6,082	\$22,365	\$53,997	\$104,298	\$47,038	\$107,941	\$202,542	\$17,742	\$42,517	\$81,783
3. Product reformulation/process modification	\$4,873	\$10,540	\$19,279	\$173,940	\$384,682	\$710,002	\$422,295	\$925,004	\$1,697,527	\$139,854	\$308,704	\$569,146
4. Packaging assessment	\$730	\$1,221	\$1,963	\$4,454	\$9,801	\$18,082	\$9,256	\$19,990	\$36,201	\$3,664	\$7,929	\$14,505
5. Packaging development	\$24	\$58	\$112	\$1,779	\$4,016	\$7,476	\$4,120	\$9,054	\$16,593	\$1,411	\$3,172	\$5,891
6. Product and package performance testing	\$3,164	\$5,012	\$7,657	\$17,798	\$38,195	\$69,256	\$37,908	\$84,343	\$154,146	\$14,766	\$31,352	\$56,507
7. Production scale-up testing	\$4,172	\$8,010	\$14,114	\$60,356	\$125,760	\$226,642	\$146,410	\$300,720	\$537,008	\$49,236	\$102,138	\$183,686
8. Recordkeeping	\$233	\$536	\$2,155	\$56,006	\$120,720	\$220,913	\$147,446	\$320,580	\$586,520	\$45,322	\$97,864	\$179,418
Analytical tests	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308
Consumer tests	\$0	\$0	\$0	\$29,706	\$38,250	\$46,946	\$205,240	\$265,016	\$322,948	\$31,493	\$40,594	\$49,687
Total	\$16,540	\$31,526	\$55,679	\$376,951	\$794,935	\$1,436,930	\$1,040,817	\$2,068,618	\$3,611,619	\$312,213	\$650,000	\$1,167,042
<b>Change in Production Process (and ingredient Change)</b>	<b>Small Companies</b>			<b>Medium Companies</b>			<b>Large Companies</b>			<b>Total</b>		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Reformulation Activity</b>												
1. Determine response to regulation	\$1,377	\$2,044	\$3,010	\$11,748	\$23,052	\$40,628	\$23,610	\$42,492	\$71,075	\$9,458	\$18,143	\$31,581
2. Project management	\$2,511	\$6,260	\$12,333	\$46,259	\$111,612	\$215,470	\$97,168	\$223,042	\$418,610	\$36,652	\$87,818	\$168,899
3. Product reformulation/process modification	\$14,618	\$31,620	\$57,839	\$348,311	\$769,865	\$1,420,480	\$844,158	\$1,849,508	\$3,394,398	\$281,369	\$620,743	\$1,144,120
4. Packaging assessment	\$1,891	\$2,942	\$4,495	\$9,339	\$20,101	\$36,733	\$18,079	\$39,480	\$71,833	\$7,708	\$16,298	\$29,511
5. Packaging development	\$810	\$1,088	\$1,467	\$3,358	\$6,824	\$12,128	\$9,636	\$17,582	\$29,440	\$2,993	\$5,805	\$10,076
6. Product and package performance testing	\$3,164	\$5,012	\$7,657	\$17,798	\$38,195	\$69,256	\$37,940	\$84,343	\$154,146	\$14,768	\$31,352	\$56,507
7. Production scale-up testing	\$5,899	\$10,010	\$16,387	\$73,270	\$140,720	\$243,647	\$178,696	\$338,120	\$579,523	\$60,068	\$114,685	\$197,949
8. Recordkeeping	\$233	\$536	\$4,428	\$56,006	\$120,720	\$220,913	\$147,446	\$320,580	\$586,606	\$45,322	\$97,864	\$180,078
Analytical tests	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308
Consumer tests	\$0	\$0	\$0	\$29,706	\$38,250	\$46,946	\$205,240	\$265,016	\$322,948	\$31,493	\$40,594	\$49,687
Total	\$31,192	\$60,488	\$108,924	\$596,484	\$1,270,314	\$2,307,509	\$1,562,662	\$3,181,138	\$5,629,886	\$490,519	\$1,034,278	\$1,869,716

**Table 3-12. Per-Formula Costs by Reformulation Activity and Company Size for Medium-Complexity Foods**

Substitution of a Minor Nonfunctional Ingredient	Small Companies		3–12 Medium Companies			Large Companies				Total		
Reformulation Activity	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
1. Determine response to regulation	\$341	\$844	\$1,646	\$1,847	\$4,513	\$8,775	\$3,196	\$7,498	\$14,248	\$1,768	\$4,289	\$8,305
2. Project management	\$639	\$1,565	\$3,041	\$4,919	\$11,885	\$22,966	\$10,318	\$23,681	\$44,441	\$4,863	\$11,620	\$22,314
3. Product reformulation/process modification	\$1,534	\$3,363	\$6,180	\$6,277	\$13,821	\$25,468	\$15,155	\$33,118	\$60,717	\$6,525	\$14,338	\$26,385
4. Packaging assessment	\$128	\$360	\$775	\$811	\$1,832	\$3,503	\$1,765	\$3,898	\$7,127	\$812	\$1,835	\$3,487
5. Packaging development	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6. Product and package performance testing	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
7. Production scale-up testing	\$168	\$350	\$642	\$3,730	\$8,048	\$14,738	\$9,029	\$19,208	\$34,871	\$3,770	\$8,103	\$14,806
8. Recordkeeping	\$100	\$268	\$566	\$11,190	\$24,144	\$44,215	\$29,495	\$64,116	\$117,304	\$11,507	\$24,888	\$45,576
Analytical tests	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Consumer tests	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$2,910	\$6,750	\$12,850	\$28,774	\$64,243	\$119,665	\$68,958	\$151,519	\$278,708	\$29,246	\$65,073	\$120,874

Substitution of a Minor Functional Ingredient	Small Companies		Medium Companies			Large Companies				Total		
Reformulation Activity	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
1. Determine response to regulation	\$1,377	\$2,044	\$3,010	\$3,695	\$9,026	\$17,549	\$6,429	\$14,996	\$28,370	\$3,644	\$8,631	\$16,555
2. Project management	\$1,278	\$3,130	\$6,082	\$15,544	\$37,462	\$72,262	\$32,621	\$74,898	\$140,597	\$15,260	\$36,386	\$69,778
3. Product reformulation/process modification	\$2,982	\$6,626	\$12,246	\$25,898	\$57,270	\$105,707	\$62,862	\$137,675	\$252,654	\$26,462	\$58,378	\$107,598
4. Packaging assessment	\$299	\$641	\$1,199	\$2,097	\$4,750	\$8,871	\$4,482	\$9,845	\$17,978	\$2,086	\$4,687	\$8,710
5. Packaging development	\$11	\$27	\$54	\$555	\$1,255	\$2,339	\$1,288	\$2,830	\$5,188	\$553	\$1,242	\$2,306
6. Product and package performance testing	\$3,164	\$5,012	\$7,657	\$17,798	\$38,195	\$69,256	\$37,940	\$84,343	\$154,146	\$17,787	\$38,222	\$69,222
7. Production scale-up testing	\$1,655	\$3,505	\$6,488	\$28,003	\$60,360	\$110,457	\$67,780	\$144,060	\$261,342	\$28,360	\$60,901	\$111,214
8. Recordkeeping	\$233	\$536	\$1,018	\$22,408	\$48,288	\$88,349	\$58,990	\$128,232	\$234,608	\$23,041	\$49,775	\$91,075
Analytical tests	\$111	\$188	\$262	\$111	\$188	\$262	\$111	\$188	\$262	\$111	\$188	\$262
Consumer tests	\$0	\$0	\$0	\$4,973	\$6,300	\$7,784	\$17,188	\$26,116	\$33,068	\$5,544	\$7,488	\$9,338
Total	\$11,110	\$21,709	\$38,016	\$121,082	\$263,094	\$482,836	\$289,691	\$623,183	\$1,128,213	\$122,847	\$265,898	\$486,057

(continued)

**Table 3-12. Per-Formula Costs by Reformulation Activity and Company Size for Medium-Complexity Foods (continued)**

Substitution of a Major Ingredient	Small Companies			Medium Companies			Large Companies			Total		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Reformulation Activity</b>												
1. Determine response to regulation	\$1,377	\$2,044	\$3,010	\$9,858	\$18,539	\$32,008	\$20,414	\$34,994	\$56,827	\$9,732	\$17,858	\$30,371
2. Project management	\$2,511	\$6,260	\$12,333	\$33,775	\$81,556	\$157,397	\$71,009	\$163,013	\$305,973	\$33,131	\$79,126	\$151,822
3. Product reformulation/process modification	\$6,224	\$13,552	\$24,831	\$248,296	\$549,332	\$1,014,058	\$603,119	\$1,321,220	\$2,424,758	\$250,435	\$552,627	\$1,018,594
4. Packaging assessment	\$730	\$1,221	\$1,963	\$4,454	\$9,801	\$18,082	\$9,256	\$19,990	\$36,201	\$4,417	\$9,621	\$17,635
5. Packaging development	\$24	\$58	\$112	\$1,779	\$4,016	\$7,476	\$4,120	\$9,054	\$16,593	\$1,770	\$3,969	\$7,362
6. Product and package performance testing	\$3,164	\$5,012	\$7,657	\$17,798	\$38,195	\$69,256	\$37,940	\$84,343	\$154,146	\$17,787	\$38,222	\$69,222
7. Production scale-up testing	\$5,035	\$9,010	\$15,250	\$64,707	\$130,800	\$232,371	\$137,260	\$290,120	\$524,958	\$63,638	\$129,821	\$231,542
8. Recordkeeping	\$233	\$536	\$3,291	\$56,006	\$120,720	\$220,913	\$147,446	\$320,580	\$586,520	\$57,536	\$124,319	\$227,827
Analytical tests	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308
Consumer tests	\$0	\$0	\$0	\$29,706	\$38,250	\$46,946	\$205,240	\$265,016	\$322,948	\$44,098	\$56,862	\$69,541
Total	\$19,987	\$38,668	\$69,754	\$467,068	\$992,184	\$1,799,815	\$1,236,494	\$2,509,306	\$4,430,231	\$483,234	\$1,013,400	\$1,825,222
<b>Change in Production Process (and Ingredient Change)</b>	<b>Small Companies</b>			<b>Medium Companies</b>			<b>Large Companies</b>			<b>Total</b>		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Reformulation Activity</b>												
1. Determine response to regulation	\$1,377	\$2,044	\$3,010	\$11,748	\$23,052	\$40,627	\$23,610	\$42,492	\$71,075	\$11,482	\$22,022	\$38,316
2. Project management	\$5,023	\$12,521	\$24,498	\$71,932	\$173,618	\$335,274	\$151,154	\$346,954	\$651,158	\$70,505	\$168,319	\$323,071
3. Product reformulation/process modification	\$19,503	\$41,656	\$75,734	\$497,886	\$1,100,164	\$2,029,823	\$1,205,747	\$2,641,940	\$4,849,036	\$502,826	\$1,108,472	\$2,042,268
4. Packaging assessment	\$2,754	\$3,942	\$5,632	\$10,202	\$21,101	\$37,870	\$18,079	\$39,480	\$71,833	\$9,942	\$20,528	\$36,732
5. Packaging development	\$1,500	\$1,888	\$2,377	\$4,048	\$7,624	\$13,037	\$9,636	\$17,582	\$29,440	\$4,269	\$7,841	\$13,215
6. Product and package performance testing	\$3,164	\$5,012	\$7,657	\$17,798	\$38,195	\$69,256	\$37,940	\$84,343	\$154,146	\$17,787	\$38,222	\$69,222
7. Production scale-up testing	\$8,488	\$13,010	\$19,797	\$90,534	\$160,720	\$266,382	\$140,713	\$294,120	\$529,505	\$83,757	\$153,128	\$258,036
8. Recordkeeping	\$233	\$536	\$7,838	\$56,006	\$120,720	\$220,913	\$147,446	\$320,580	\$586,606	\$57,536	\$124,319	\$228,509
Analytical tests	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308
Consumer tests	\$0	\$0	\$0	\$29,706	\$38,250	\$46,946	\$205,240	\$265,016	\$322,948	\$44,098	\$56,862	\$69,541
Total	\$42,732	\$81,585	\$147,850	\$790,549	\$1,684,419	\$3,061,436	\$1,940,254	\$4,053,482	\$7,267,054	\$802,892	\$1,700,688	\$3,080,218

**Table 3-13. Per-Formula Costs by Reformulation Activity and Company Size for High-Complexity Foods**

Substitution of a minor nonfunctional ingredient	Small Companies			Medium Companies			Large Companies			Total		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Reformulation Activity</b>												
1. Determine response to regulation	\$341	\$844	\$1,646	\$1,847	\$4,513	\$8,775	\$3,196	\$7,498	\$14,248	\$1,743	\$4,173	\$8,021
2. Project management	\$959	\$2,348	\$4,562	\$4,919	\$11,885	\$22,966	\$10,318	\$23,681	\$44,441	\$5,175	\$12,156	\$23,121
3. Product reformulation/process modification	\$2,982	\$6,626	\$12,246	\$6,277	\$13,821	\$25,468	\$15,155	\$33,118	\$60,717	\$7,745	\$17,002	\$31,252
4. Packaging assessment	\$128	\$360	\$775	\$811	\$1,832	\$3,503	\$1,765	\$3,898	\$7,127	\$862	\$1,944	\$3,652
5. Packaging development	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6. Product and package performance testing	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
7. Production scale-up testing	\$168	\$350	\$642	\$3,730	\$8,048	\$14,738	\$9,029	\$19,208	\$34,871	\$4,087	\$8,736	\$15,911
8. Recordkeeping	\$100	\$268	\$566	\$11,190	\$24,144	\$44,215	\$29,495	\$64,116	\$117,304	\$12,819	\$27,811	\$50,924
Analytical tests	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Consumer tests	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$4,678	\$10,796	\$20,437	\$28,774	\$64,243	\$119,665	\$68,958	\$151,519	\$278,708	\$32,431	\$71,823	\$132,881
Substitution of a minor functional ingredient	Small Companies			Medium Companies			Large Companies			Total		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Reformulation Activity</b>												
1. Determine response to regulation	\$1,377	\$2,044	\$3,010	\$3,695	\$9,026	\$17,549	\$6,429	\$14,996	\$28,370	\$3,723	\$8,462	\$15,913
2. Project management	\$1,872	\$4,695	\$9,292	\$15,544	\$37,462	\$72,262	\$32,621	\$74,898	\$140,597	\$15,981	\$37,509	\$71,321
3. Product reformulation/process modification	\$5,878	\$13,152	\$24,377	\$25,898	\$57,270	\$105,707	\$62,862	\$137,675	\$252,654	\$29,960	\$65,920	\$121,287
4. Packaging assessment	\$299	\$641	\$1,199	\$2,097	\$4,750	\$8,871	\$4,482	\$9,845	\$17,978	\$2,194	\$4,871	\$8,980
5. Packaging development	\$11	\$27	\$54	\$555	\$1,255	\$2,339	\$1,288	\$2,830	\$5,188	\$588	\$1,306	\$2,410
6. Product and package performance testing	\$3,164	\$5,012	\$7,657	\$17,798	\$38,195	\$69,256	\$37,940	\$84,343	\$154,146	\$18,799	\$40,600	\$73,499
7. Production scale-up testing	\$1,655	\$3,505	\$6,488	\$28,003	\$60,360	\$110,457	\$67,780	\$144,060	\$261,342	\$30,810	\$65,807	\$119,795
8. Recordkeeping	\$233	\$536	\$1,018	\$22,408	\$48,288	\$88,349	\$58,990	\$128,232	\$234,608	\$25,659	\$55,623	\$101,779
Analytical tests	\$111	\$188	\$262	\$111	\$188	\$262	\$111	\$188	\$262	\$111	\$188	\$262
Consumer tests	\$0	\$0	\$0	\$4,973	\$6,300	\$7,784	\$17,188	\$26,116	\$33,068	\$6,850	\$9,920	\$12,486
Total	\$14,600	\$29,800	\$53,357	\$121,082	\$263,094	\$482,836	\$289,691	\$623,183	\$1,128,213	\$134,674	\$290,206	\$527,733

(continued)

**Table 3-13. Per-Formula Costs by Reformulation Activity and Company Size for High-Complexity Foods (continued)**

Substitution of a major ingredient	Small Companies			Medium Companies			Large Companies			Total		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Reformulation Activity</b>												
1. Determine response to regulation	\$1,377	\$2,044	\$3,010	\$9,858	\$18,539	\$32,008	\$20,414	\$34,994	\$56,827	\$10,118	\$17,879	\$29,671
2. Project management	\$3,790	\$9,391	\$18,416	\$48,657	\$117,382	\$226,588	\$102,205	\$234,607	\$440,319	\$49,377	\$115,777	\$219,991
3. Product reformulation/process modification	\$11,985	\$26,604	\$49,197	\$248,296	\$549,332	\$1,013,965	\$603,090	\$1,321,220	\$2,424,847	\$272,911	\$600,081	\$1,103,695
4. Packaging assessment	\$730	\$1,221	\$1,963	\$4,454	\$9,801	\$18,082	\$9,256	\$19,990	\$36,201	\$4,616	\$9,924	\$18,020
5. Packaging development	\$24	\$58	\$112	\$1,779	\$4,016	\$7,476	\$4,120	\$9,054	\$16,593	\$1,878	\$4,169	\$7,688
6. Product and package performance testing	\$3,164	\$5,012	\$7,657	\$17,798	\$38,195	\$69,256	\$37,940	\$84,343	\$154,146	\$18,799	\$40,600	\$73,499
7. Production scale-up testing	\$5,035	\$9,010	\$15,250	\$64,707	\$130,800	\$232,371	\$157,288	\$313,320	\$551,330	\$71,778	\$143,390	\$252,977
8. Recordkeeping	\$233	\$536	\$3,291	\$56,006	\$120,720	\$220,913	\$147,446	\$320,580	\$586,520	\$64,020	\$138,796	\$254,706
Analytical tests	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308
Consumer tests	\$0	\$0	\$0	\$29,706	\$38,250	\$46,946	\$205,240	\$265,016	\$322,948	\$70,273	\$90,697	\$110,654
<b>Total</b>	<b>\$27,027</b>	<b>\$54,851</b>	<b>\$100,203</b>	<b>\$481,950</b>	<b>\$1,028,010</b>	<b>\$1,868,913</b>	<b>\$1,287,689</b>	<b>\$2,604,100</b>	<b>\$4,591,038</b>	<b>\$564,458</b>	<b>\$1,162,290</b>	<b>\$2,072,209</b>
Change in production process (and ingredient change)	Small Companies			Medium Companies			Large Companies			Total		
	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile	5th Percentile	Mean	95th Percentile
<b>Reformulation Activity</b>												
1. Determine response to regulation	\$1,377	\$2,044	\$3,010	\$11,748	\$23,052	\$40,628	\$23,610	\$42,492	\$71,075	\$11,767	\$21,777	\$37,096
2. Project management	\$7,580	\$18,781	\$36,831	\$105,334	\$254,226	\$490,916	\$221,294	\$508,039	\$953,494	\$106,700	\$250,223	\$475,487
3. Product reformulation/process modification	\$37,679	\$81,812	\$149,866	\$498,749	\$1,101,164	\$2,030,866	\$1,205,747	\$2,641,940	\$4,849,125	\$550,998	\$1,210,300	\$2,225,122
4. Packaging assessment	\$3,617	\$4,942	\$6,769	\$11,065	\$22,101	\$39,007	\$18,079	\$39,480	\$71,833	\$10,648	\$21,489	\$37,907
5. Packaging development	\$2,191	\$2,688	\$3,286	\$4,739	\$8,424	\$13,947	\$13,089	\$21,582	\$33,987	\$6,299	\$10,323	\$16,212
6. Product and package performance testing	\$3,164	\$5,012	\$7,657	\$17,798	\$38,195	\$69,256	\$37,908	\$84,343	\$154,146	\$18,790	\$40,600	\$73,499
7. Production scale-up testing	\$8,488	\$13,010	\$19,797	\$90,534	\$160,720	\$266,382	\$221,854	\$388,120	\$636,355	\$101,409	\$177,717	\$291,996
8. Recordkeeping	\$233	\$536	\$7,838	\$56,006	\$120,720	\$220,913	\$147,446	\$320,580	\$586,520	\$64,020	\$138,796	\$256,186
Analytical tests	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308	\$689	\$975	\$1,308
Consumer tests	\$0	\$0	\$0	\$29,706	\$38,250	\$46,946	\$205,240	\$265,016	\$322,948	\$70,273	\$90,697	\$110,654
<b>Total</b>	<b>\$65,018</b>	<b>\$129,801</b>	<b>\$236,362</b>	<b>\$826,368</b>	<b>\$1,767,827</b>	<b>\$3,220,168</b>	<b>\$2,094,956</b>	<b>\$4,312,567</b>	<b>\$7,680,790</b>	<b>\$941,591</b>	<b>\$1,962,897</b>	<b>\$3,525,467</b>



### **3.4.5 Accounting for Uncertainty in the Cost Estimates**

In the sections above, we noted the assumptions regarding the interpretation of the low-, middle-, and high-cost estimates for each component of costs in the model. Because the model allows users the option of revising wage rates directly in the model, the model does not jointly simulate the final cost ranges by drawing from the distribution of all costs in the model. However, the distribution of individual cost components is accounted for in a manner consistent with the previous version of the model.

To recap the discussions in this section, the probability ranges of each component of costs are as follows:

- Labor hour estimates represent 5th percentile, mean, and 95th percentile estimates simulated using a triangular distribution in @Risk.
- Wage rates represent 10th percentile, mean, and 90th percentile estimates as reported directly by BLS.
- Analytical tests and market tests represent 5th percentile, mean, and 95th percentile estimates simulated using a triangular distribution in @Risk.



# 4

## Instructions for Using the Reformulation Cost Model

In this section, we provide a brief overview of the structure of the FDA Reformulation Cost Model, provide instructions for selecting the model inputs, and describe the model's output.

---

### 4.1 AN OPERATIONAL OVERVIEW OF THE MODEL

In addition to data updates, the major changes to the model operation compared with the previous version are the

- option to save and retrieve scenarios and
- option to alter wage rates.

The FDA Reformulation Cost Model is a stand-alone program and thus can be run on any computer with Microsoft Excel 2010. The model contains aggregated Nielsen ScanTrack data for 2012 and cost estimates obtained from an expert panel in May 2014. These cost estimates include labor, materials, and testing expenses associated with the various steps in reformulating food products under FDA's jurisdiction.

Users must select the product categories affected by a regulatory change (by product type or by NAICS), the type of reformulation, and the compliance period. The other user inputs are optional, including adjusting the percentage of affected products, analytical testing costs, market testing costs, recordkeeping costs, wage rates, small company size definition, and an inflation factor. Users have the option of running the model with the existing input data or modifying any of the default values. When users run the model, it generates estimates of total industry costs for reformulating foods.

The model was developed in Microsoft Excel with Visual Basic components. It contains several tabs (worksheets) representing

the user inputs, data sheets, and model outputs. The input and data worksheets (COLOR tabs in the model) are as follows:

- **Main Menu:** Directs the user to the main menu to select or enter inputs in the model
- **Total Costs:** Contains the numbers of formulas and UPCs for branded products across company sizes and stores the cost estimates during calculations
- **Detailed Costs:** Contains the specific cost estimates for each reformulation activity used to calculate industrywide costs
- **Utilities & Materials:** Contains utilities and materials cost estimates by reformulation activity across company sizes for each type of change
- **Labor Hours:** Contains labor hours by reformulation activity across company sizes for each type of change
- **Wage Rates:** Contains wage rates by reformulation activity across company sizes
- **Analytical:** Contains cost estimates for analytical tests that may be conducted during the reformulation process
- **Consumer:** Contains cost estimates for consumer testing that may be conducted during the reformulation process
- **Compliance:** Contains compliance period in months and cost escalation factors for short compliance periods across company sizes

The output worksheets include the following:

- a summary of the user inputs for the model run
- counts of UPCs, formulas, and sales units and cost estimates across all reformulation activities for products affected by the regulation
- total and per-formula cost estimates by reformulation activity for products affected by the regulation
- counts of UPCs, formulas, and sales units and cost estimates across all reformulation activities (two activities only) for products not affected by the regulation
- total and per-formula cost estimates by reformulation activity (two activities only) for products not affected by the regulation
- detailed data underlying the cost estimates

## 4.2 SELECTING MODEL INPUTS AND RUNNING THE MODEL

To run the Reformulation Cost Model, open the Excel file **FDA Reformulation Cost Model.xlsm**. If a warning about macros appears, click **Enable Macros**. The file will open to the Main Menu selection screen (see Figure 4-1).

**Figure 4-1. Main Menu Selection Screen**

**FDA Reformulation Cost Model**

The FDA Reformulation Cost Model provides estimates of the costs of reformulating foods under FDA's jurisdiction. Data on the number of UPCs and formulas are based on 2012 Nielsen scanner data with adjustments for representativeness. Cost data are based on ranges of estimates obtained from industry experts in 2014.

[Load Saved Scenario](#)

**Instructions:**  
Follow each step below to select the model inputs that most closely correspond to the anticipated reformulation in response to regulation.

Step 1: Select product categories, reformulation type, and test types (required).....

Step 2: Select cost assumptions:

a. Wage rates (optional).....

b. Recordkeeping costs (optional).....

c. Small company size definition (optional).....

Step 3: Select compliance period (required).....

Step 4: Enter an inflation factor relative to 2014 (0.5 - 10.0) (optional).....

Step 5: After selecting all inputs.....

[Select by Type](#)

[Select by NAICS](#)

[Modify Wage Rates](#)

Yes ▾

<\$1 MM in sales ▾

▾

1.00

[Calculate Costs](#)

[More Info](#)

[More Info](#)

[More Info](#)

[More Info](#)

[More Info](#)

[More Info](#)

[More Info](#)

Model results will be output to an Excel spreadsheet.

[Reset All Selections](#)
[Exit](#)

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< >

Main Menu

Total Costs

Detailed Costs

Utilities & Materials

Labor Hours

Wage Rates

Analytical

Consumer

Compliance

Note you may click **Reset All Selections** or **Reset Default Values** to clear all of your selections on every menu. The **More Info** buttons on the right side of the Main Menu or at the bottom of each input menu can be used to obtain additional instructions or information for each of the model inputs.

#### 4.2.1 Selection of Affected Products

##### **Step 1 (required).**

Select product categories and subcategories, percentage of affected products by the regulation, reformulation type, and analytical and consumer testing.

The first step in running the model is to select the products affected by the regulatory requirement. This can be done either by selecting product subcategories by type of product (e.g., foods, dietary supplements, cosmetics) or by NAICS code.

To choose the affected product subcategories by Product Type:

- On the Main Menu screen, click **Select by Type**.

When the Affected Products by Type worksheet opens (see Figure 4-2), select the chosen product category (baked goods, seafood, entrees, etc.). The Product Category list will then populate with the product subcategories within the selected product category.

- To select all product subcategories in a product category, click **Add Entire Category** (see Figure 4-3).

OR

- To select individual product subcategories within the selected Product Type:
  - Select the desired product subcategory.
  - Click **Add Subcategory** to add it to the selected User Selection list (or double-click on each desired product subcategory).

The selected products will appear in the “User Selection” list to the right.

**Figure 4-2. Affected Products Selection Screen**

FDA Reformulation Cost Model

✖

**Product Category Selections**

**Current user selections:**  
*To view the entire selection, double-click on the item.*

a. Select product categories:  
*Click on the product category to display the product subcategories. Then double-click on the product subcategory (or single click and then click "Add SubCategory"). You may also select the entire product category by clicking "Add Entire Category."*

Product Category	Product Subcategories	User Selections
<div style="border: 1px solid black; padding: 5px;"> <div style="border-bottom: 1px solid black; padding-bottom: 2px;">Baked goods</div> <div style="padding: 2px;">Baking ingredients</div> <div style="padding: 2px;">Beverages</div> <div style="padding: 2px;">Breakfast foods</div> <div style="padding: 2px;">Candy &amp; gum</div> <div style="padding: 2px;">Condiments/dips/spreads</div> <div style="padding: 2px;">Dairy foods</div> <div style="padding: 2px;">Desserts</div> <div style="padding: 2px;">Dressings &amp; sauces</div> <div style="padding: 2px;">Eggs</div> <div style="padding: 2px;">Entrees</div> <div style="padding: 2px;">Fats &amp; oils</div> <div style="padding: 2px;">Fruits &amp; vegetables</div> <div style="padding: 2px;">Infant foods</div> <div style="padding: 2px;">Pizza</div> <div style="padding: 2px;">Seafood</div> </div>	<div style="border: 1px solid black; width: 100%; height: 100px; margin: 5px 0;"></div> <div style="font-size: 24px; line-height: 1;">&gt;&gt;</div>	<div style="border: 1px solid black; width: 100%; height: 100px; margin: 5px 0;"></div>
	<div style="margin: 5px 0;">Add Subcategory &gt;&gt;</div> <div style="margin: 5px 0;">&lt;&lt; Remove Subcategory</div> <div style="margin: 5px 0;">Add Entire Category &gt;&gt;</div>	

b. Enter the percentage of the selected product subcategories affected by the regulation.....  %

c. Enter the percentage of the affected products that will be reformulated.....  %

d. Select anticipated type of reformulation..... 

▼

e. Select analytical and consumer testing costs..... 

Select Tests

f. Save selections..... 

Save Selections

Back to Main Menu

Reset Selections

More Info

**Figure 4-3. Affected Products Selection Screen—Selecting Entire List of Product Subcategories**

FDA Reformulation Cost Model

Product Category Selections

**Current user selections:**  
To view the entire selection, double-click on the item.

a. Select product categories:  
Click on the product category to display the product subcategories. Then double-click on the product subcategory (or single click and then click "Add SubCategory"). You may also select the entire product category by clicking "Add Entire Category."

Product Category	Product Subcategories	User Selections
Baked goods	Bagels/biscuits/buns/muffins/rolls - fresh	Bagels/biscuits/buns/muffins/rolls - fresh
Baking ingredients	Bagels/biscuits/buns/muffins/rolls - frozen	Bagels/biscuits/buns/muffins/rolls - frozen
Beverages	Baked goods - remaining - fresh	Baked goods - remaining - fresh
Breakfast foods	Baked goods - remaining - frozen	Baked goods - remaining - frozen
Candy & gum	Bread - fresh	Bread - fresh
Condiments/dips/spreads	Bread - frozen	Bread - frozen
Dairy foods	Breading products	Breading products
Desserts	Cakes/doughnuts/sweet rolls - fresh	Cakes/doughnuts/sweet rolls - fresh
Dressings & sauces	Cakes/doughnuts/sweet rolls - frozen	Cakes/doughnuts/sweet rolls - frozen
Eggs	Cookies/cones	Cookies/cones
Entrees	Crackers	Crackers
Fats & oils	Mexican shells/tortillas	Mexican shells/tortillas
Fruits & vegetables		
Infant foods		
Pizza		
Seafood		

b. Enter the percentage of the selected product subcategories affected by the regulation..... 100 %

c. Enter the percentage of the affected products that will be reformulated..... 100 %

d. Select anticipated type of reformulation.....

e. Select analytical and consumer testing costs.....

f. Save selections.....

You may also choose the affected product subcategories by NAICS code. To do so, follow the steps below:

- On the Main Menu screen, click **Select by NAICS**.
- When the Affected Products by NAICS worksheet opens (see Figure 4-4), select the 6-digit NAICS code representing the products affected by the labeling regulation from the drop-down menu at the top of the screen.
- The product categories list will then populate with the product subcategories within the selected 6-digit NAICS code.



**Figure 4-4. Affected Products by NAICS Selection Screen**

The screenshot shows the 'FDA Reformulation Cost Model' window. At the top, it says 'Product Category Selections (by NAICS Code)'. Below this, it states 'Current user selections:' and 'To view the entire selection, double-click on the item.' There is a large empty box for current selections.

Section 'a. Select product categories:' includes instructions: 'Click on the NAICS code to display the product subcategories. Then double-click on the product subcategory (or single click and then click "Add Subcategory"). You may also select the entire NAICS code by clicking "Add Entire NAICS."'

The interface is divided into three main areas:
 

- NAICS Code:** A list box containing codes and descriptions such as '111211 - Potato farming', '111219 - Other vegetable (except potato) & melon farming', '111339 - Other noncitrus fruit farming', '311211 - Flour milling', '311212 - Rice milling', '311225 - Fats & oils refining & blending', '311230 - Breakfast cereal manufacturing', '311311 - Sugarcane mills', '311320 - Chocolate & confectionery mfg from cacao beans', '311340 - Nonchocolate confectionery manufacturing', '311411 - Frozen fruit, juice, & vegetable manufacturing', '311412 - Frozen specialty food manufacturing', '311421 - Fruit & vegetable canning', '311422 - Specialty canning', '311423 - Dried & dehydrated food manufacturing', and '311511 - Fluid milk manufacturing'.
- Product Subcategories:** An empty box with a '>>' button between it and the NAICS list.
- User Selections:** An empty box with buttons 'Add Subcategory >>', '<< Remove Subcategory', and 'Add Entire NAICS >>'.

Below these areas are input fields and buttons:
 

- b. Enter the percentage of the selected product subcategories affected by the regulation..... 100 %
- c. Enter the percentage of the affected products that will be reformulated..... 100 %
- d. Select anticipated type of reformulation..... (dropdown menu)
- e. Select analytical and consumer testing costs..... [Select Tests button]
- f. Save selections..... [Save Selections button]

At the bottom are three buttons: 'Back to Main Menu', 'Reset Selections', and 'More Info'.

- To select all products within a product category, click **Add Entire NAICS**.

OR

- To select individual product subcategories within the selected category (see Figure 4-5):
  - Select the desired 6-digit NAICS.
  - Select **Add Subcategory** to add the product subcategories within the selected 6-digit NAICS.

The selected products will appear in the “User Selection” list to the right.

Note that on both the Product Categories by Type and Product Categories by NAICS screens, you also have the option of clearing all selections and starting over.

**Figure 4-5. Affected Products by NAICS Selection Screen—Selecting and Adding 6-Digit NAICS and Product Subcategories**

FDA Reformulation Cost Model

Product Category Selections (by NAICS Code)

**Current user selections:**  
To view the entire selection, double-click on the item.

a. Select product categories:  
Click on the NAICS code to display the product subcategories. Then double-click on the product subcategory (or single click and then click "Add Subcategory"). You may also select the entire NAICS code by clicking "Add Entire NAICS."

NAICS Code	Product Subcategories	User Selections
111211 - Potato farming	Beans - canned	
111219 - Other vegetable (except potato) & melon farming	Fruit - canned	
111339 - Other noncitrus fruit farming	Fruit juice - refrigerated	
311211 - Flour milling	Fruit juice - shelf stable	
311212 - Rice milling	Jams/jellies	
311225 - Fats & oils refining & blending	Jams/spreads - remaining	
311230 - Breakfast cereal manufacturing	Juices - baby	
311311 - Sugarcane mills	Pickles/olives/relishes	
311320 - Chocolate & confectionery mfg from cacao beans	Potatoes - canned	
311340 - Nonchocolate confectionery manufacturing	Sandwich spreads/horseradish/sauerkraut - refri	
311411 - Frozen fruit, juice, & vegetable manufacturing	Sauce - barbecue	
311412 - Frozen specialty food manufacturing	Sauce - spaghetti/marinara	
311422 - Specialty canning	Soup - canned	
311423 - Dried & dehydrated food manufacturing	Tomatoes - canned	
311511 - Fluid milk manufacturing	Vegetable juice - shelf stable	

b. Enter the percentage of the selected product subcategories affected by the regulation..... 100 %

c. Enter the percentage of the affected products that will be reformulated..... 100 %

d. Select anticipated type of reformulation.....

e. Select analytical and consumer testing costs.....

f. Save selections.....

After selecting all desired products, you may select the percentage of product categories affected by the regulation and the percentage affected by the reformulation. By default, the model assumes 100% of the UPCs in the product categories selected in the previous step will be affected by the regulation. To adjust the costs for a specific percentage of products, click the cell to the left of each regulation percentage or reformulation percentage that you want to change and enter a percentage in whole numbers for each (see Figure 4-6).

The anticipated type of reformulation is a required selection and must be selected to proceed. To do this, select the drop-down menu and choose the desired reformulation (see Figure 4-7).

**Figure 4-6. Affected Products by NAICS Selection Screen—Change Regulation Percentage or Reformulation Percentage**

FDA Reformulation Cost Model

Product Category Selections (by NAICS Code)

**Current user selections:**  
To view the entire selection, double-click on the item.

a. Select product categories:  
Click on the NAICS code to display the product categories. Then double-click on the product category (or single click and then click "Add Category").  
You may also select the entire product type by clicking "Add Entire Type."

NAICS Code	Product Categories	User Selection
111211 - Potato farming	Beans - canned	Beans - canned
111219 - Other vegetable (except potato) & melon farming	Fruit - canned	
111339 - Other noncitrus fruit farming	Fruit juice - refrigerated	
111211 - Flour milling	Fruit juice - shelf stable	
111212 - Rice milling	Jams/jellies	
111225 - Fats & oils refining & blending	Jams/spreads - remaining	
111230 - Breakfast cereal manufacturing	Juices - baby	
111311 - Sugarcane mills	Pickles/olives/relishes	
111320 - Chocolate & confectionery mfg from cacao beans	Potatoes - canned	
111340 - Nonchocolate confectionery manufacturing	Sandwich spreads/horseradish/sauerkraut - refri	
111411 - Frozen fruit, juice, & vegetable manufacturing	Sauce - barbecue	
111412 - Frozen specialty food manufacturing	Sauce - spaghetti/marinara	
311421 - Fruit & vegetable canning	Soup - canned	
111422 - Specialty canning	Tomatoes - canned	
111423 - Dried & dehydrated food manufacturing	Vegetable juice - shelf stable	
111511 - Fluid milk manufacturing		

b. Enter the percentage of the selected product categories affected by the regulation..... 100 %

c. Enter the percentage of the affected products that will be reformulated..... 100 %

d. Select anticipated type of reformulation.....

e. Select analytical and consumer testing costs for the product category.....

f. Save selections.....

**Figure 4-7. Affected Products by NAICS Selection Screen—Select Type of Reformulation**

FDA Reformulation Cost Model

Product Category Selections (by Product Type)

**Current user selections:**  
To view the entire selection, double-click on the item.

a. Select product categories:  
Click on the product type to display the product categories. Then double-click on the product category (or single click and then click "Add Category"). You may also select the entire product type by clicking "Add Entire Type."

Product Type	Product Categories	User Selection
<ul style="list-style-type: none"> <li>Baked goods</li> <li>Baking ingredients</li> <li>Beverages</li> <li>Breakfast foods</li> <li>Candy &amp; gum</li> <li>Condiments/dips/spreads</li> <li>Dairy foods</li> <li>Desserts</li> <li>Dressings &amp; sauces</li> <li>Eggs</li> <li>Entrees</li> <li>Fats &amp; oils</li> <li>Fruits &amp; vegetables</li> <li>Infant foods</li> <li>Pizza</li> <li>Seafood</li> </ul>		<p>Add Category &gt;&gt;</p> <p>&lt;&lt; Remove Category</p> <p>Add Entire Type &gt;&gt;</p>

b. Enter the percentage of the selected product categories affected by the regulation..... 100 %

c. Enter the percentage of the affected products that will be reformulated..... 100 %

d. Select anticipated type of reformulation.....

- Substitution of a minor nonfunctional ingredient
- Substitution of a minor functional ingredient
- Substitution of a major ingredient
- Change in production process (& ingredient change)

e. Select analytical and consumer testing costs for the product category.....

f. Save selections.....

Save Selections

Back to Main Menu   Reset Selections   More Info

Analytical or consumer testing costs for the product category may also be chosen in this screen, as described in Section 4.2.2 below.

After selecting all desired product subcategories, click **Save Selections** to save your selections and return to the Main Menu screen. Note, if you have not chosen an analytical or consumer test, the model will prompt you to review the default assumptions and accept or change these selections.

#### 4.2.2 Analytical and Market Testing Costs Selection

Some labeling regulations may require manufacturers to conduct analytical or market tests on each formula affected by the regulation. To include either of these types of costs in the Reformulation Cost Model:

- From the Affected Products screen (Products or NAICS): click **Select Tests** to the right of "Select analytical and consumer testing costs for the product category." A screen listing Analytical Tests and Consumer Tests will open (see Figure 4-8).

**Figure 4-8. Selecting Analytical Tests**

**FDA Reformulation Cost Model**

**Analytical and Consumer Tests**

**Analytical Tests**

Instructions:  
Enter a total analytical test cost per sample:

AND/OR select one or more analytical tests by double-clicking on the test name or single-clicking the test name and "Add Analytical Test."

Analytical Tests	Cost (Midpoint)
NFP (laboratory test)	\$845
NFP (nutrition database)	\$188
Acrylamide	\$227
Allergens	\$125
Bioengineered ingredients	\$276
Caffeine	\$102
Fat composition	\$168
Iodine	\$107
Microbiological	\$77
Minerals	\$42
pH, brix, Aw	\$20

**User Selections**

NFP (laboratory test)

**Buttons:** Add Analytical Test >>, << Remove Analytical Test

**Consumer Tests**

Small Companies | Medium Companies | Large Companies

**Small Size Company**

Instructions:  
Enter a total consumer test cost per formula:

AND/OR select one or more consumer tests by double-clicking on the test name or single-clicking the test name and "Add Consumer Test."

Consumer Tests	Cost (Midpoint)
Central location test	\$31,950
Descriptive test	\$13,058
Discrimination test	\$6,300
Focus group	\$6,500
In-home test	\$27,350

**User Selections**

**Buttons:** Add Consumer Test >>, << Remove Consumer Test

**Bottom Buttons:** Save and Return to Menu, Clear Selections, More Info

- To include costs of analytical testing in the model, under the heading "Analytical Tests," enter a cost estimate or select from a list of tests as follows:
  - Enter the total analytical test cost per formula in the first box (numeric values only). (Note: The model will automatically add labor costs for sample

preparation and shipping costs to the analytical test cost.)

- Select one or more of the analytical tests by double-clicking on the test name or single-clicking the test name and **Add Analytical Test**.

Note that you may enter an analytical test cost estimate, select one or more analytical tests from the list, or both.

- To include costs of market testing in the model, under the heading "Consumer Tests":
  - Enter the total consumer testing cost per formula in the first box (numeric values only).
  - Select one or more of the market tests by double-clicking on the test name or single-clicking the test name and **Add Consumer Test** under each tab for small, medium, and large companies (see Figure 4-9).

Note that you may enter a consumer test cost, select focus groups, or select multiple quantitative tests, including discrimination, central location, descriptive, and in-home tests, or both.

After you have entered or selected analytical and consumer test costs, click **Save and Return to Menu**.

The model includes optional input selections to modify wage rates and add recordkeeping costs as described below.

**Figure 4-9. Selecting Market Tests**

**FDA Reformulation Cost Model**

**Analytical and Consumer Tests**

**Analytical Tests**

Instructions:  
Enter a total analytical test cost per sample:

AND/OR select one or more analytical tests by double-clicking on the test name or single-clicking the test name and "Add Analytical Test."

Analytical Tests	Cost (Midpoint)
NFP (laboratory test)	\$845
NFP (nutrition database)	\$188
Acrylamide	\$227
Allergens	\$125
Bioengineered ingredients	\$276
Caffeine	\$102
Fat composition	\$168
Iodine	\$107
Microbiological	\$77
Minerals	\$42
pH, brix, Aw	\$20

Add Analytical Test >>

<< Remove Analytical Test

**User Selections**

NFP (laboratory test)

---

**Consumer Tests**

Small Companies | Medium Companies | Large Companies

**Small Size Company**

Instructions:  
Enter a total consumer test cost per formula:

AND/OR select one or more consumer tests by double-clicking on the test name or single-clicking the test name and "Add Consumer Test."

Consumer Tests	Cost (Midpoint)
Central location test	\$31,950
Descriptive test	\$13,058
Discrimination test	\$6,300
Focus group	\$6,500
In-home test	\$27,350

Add Consumer Test >>

<< Remove Consumer Test

**User Selections**

Focus group

Save and Return to Menu | Clear Selections | More Info

### 4.2.3 Wage Rates Selection

**Step 2 (optional).**  
Adjust the wage rates  
used in the model.

The model includes default wage rates obtained from BLS for the relevant labor categories included in the model. To update or modify the wage rates included by default, click **Modify Wage Rates** from the Main Menu screen. A screen will open where you may enter new hourly wage rates by occupation (see Figure 4-10). You must enter wage rates for the 10th percentile, mean, and 90th percentile to allow for calculation of cost ranges.

After you have entered new wage rates, click **Save and Return to Menu**.

**Figure 4-10. Viewing and Editing Hourly Wage Rates**

**FDA Reformulation Cost Menu**

**Wage Rates**

Instructions: Hourly wage rates including estimated benefits and overhead of 100% are displayed for relevant labor categories based on 2014 BLS data for NAICS 311 Food Manufacturing. To update these data to a later year, enter the new wage rates with benefits, enter the year of the data, and click Save and Return to Menu.

	10th Percentile	Mean	90th Percentile
Food Scientists & Technologists	31.46	59.94	95.92
Business & Financial Operations	32.90	59.50	91.12
Production Occupations	17.78	28.38	43.40
Management Occupations	48.76	105.54	182.90
Year of wage rate values	2014		

Save and Return to Menu    Reset Default Values    More Info

#### 4.2.4 Recordkeeping Costs

The model offers the option of including recordkeeping costs (e.g., for updating recipe and process information) on a per-formula basis. (Note: By default, the model will not include recordkeeping costs unless “Yes” is selected from this dialogue box.)

#### 4.2.5 Small Company Size Definition

The model offers the option of selecting a breakpoint for small versus medium companies (see Figure 4-11). This drop-down menu allows you to choose from less than \$1 million in sales or less than \$10 million in sales.



**Figure 4-11. Small Company Size Definition Screen—Select Breakpoint for Small versus Medium Companies**

**FDA Reformulation Cost Model**

The FDA Reformulation Cost Model provides estimates of the costs of reformulating foods under FDA's jurisdiction. Data on the number of UPCs and formulas are based on 2012 Nielsen scanner data with adjustments for representativeness. Cost data are based on ranges of estimates obtained from industry experts in 2014.

[Load Saved Scenario](#)

**Instructions:**  
Follow each step below to select the model inputs that most closely correspond to the anticipated reformulation in response to regulation.

Step 1: Select product categories, reformulation type, and test types (required)..... [Select by Type](#) [More Info](#)  
[Select by NAICS](#)

Step 2: Select cost assumptions:

a. Wage rates (optional)..... [Modify Wage Rates](#) [More Info](#)

b. Recordkeeping costs (optional)..... Yes [More Info](#)

c. Small company size definition (optional)..... **<\$1 MM in sales** [More Info](#)

Step 3: Select compliance period (required)..... 12 months [More Info](#)

Step 4: Enter an inflation factor relative to 2014 (0.5 - 10.0) (optional)..... 1.00 [More Info](#)

Step 5: After selecting all inputs..... [Calculate Costs](#) [More Info](#)

Model results will be output to an Excel spreadsheet.

[Reset All Selections](#) [Exit](#)

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[Main Menu](#)
[Total Costs](#)
[Detailed Costs](#)
[Utilities & Materials](#)
[Labor Hours](#)
[Wage Rates](#)
[Analytical](#)
[Consumer](#)
[Compliance](#)

**4.2.6 Compliance Period Selection**

**Step 3 (required).**  
Select a compliance period.

On the Main Menu screen, click the drop-down menu to the right of "Select compliance period (required)" to indicate the amount of time before the regulation is to take effect. This screen allows you to select the number of months manufacturers have to comply with the regulation (see Figure 4-12).

**Figure 4-12. Compliance Period Selection Screen—Select Amount of Time Manufacturers Will Have to Comply with the Regulation**

**FDA Reformulation Cost Model**

The FDA Reformulation Cost Model provides estimates of the costs of reformulating foods under FDA's jurisdiction. Data on the number of UPCs and formulas are based on 2012 Nielsen scanner data with adjustments for representativeness. Cost data are based on ranges of estimates obtained from industry experts in 2014.

[Load Saved Scenario](#)

**Instructions:**  
Follow each step below to select the model inputs that most closely correspond to the anticipated reformulation in response to regulation.

Step 1: Select product categories, reformulation type, and test types (required)..... [Select by Type](#) [More Info](#)  
[Select by NAICS](#)

Step 2: Select cost assumptions:

a. Wage rates (optional)..... [Modify Wage Rates](#) [More Info](#)

b. Recordkeeping costs (optional)..... Yes [More Info](#)

c. Small company size definition (optional)..... <\$1 MM in sales [More Info](#)

Step 3: Select compliance period (required)..... 12 months [More Info](#)

Step 4: Enter an inflation factor relative to 2014 (0.5 - 10.0) (optional)..... 1.00 [More Info](#)

Step 5: After selecting all inputs..... [Calculate Costs](#) [More Info](#)

Model results will be output to an Excel spreadsheet.

[Reset All Selections](#) [Exit](#)

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**4.2.7 Inflation Factor Modification (optional)**

**Step 4 (optional).**  
Enter an inflation factor.

From the Main Menu screen, you can enter a price adjustment factor to account for inflation (see Figure 4-13). If the costs are being estimated for a year beyond 2014, an inflation factor is necessary to more accurately reflect the present value of cost estimates. To obtain this factor, go to the BLS Web site (found at [http://www.bls.gov/data/inflation\\_calculator.htm](http://www.bls.gov/data/inflation_calculator.htm)) and use the CPI Inflation Calculator to calculate the inflation factor since 2014. The default inflation factor is 1.0 (see Figure 4-13). The possible range for this value is 0.5 to 10.0. Values less than 1.0 can be used to estimate costs for a baseline prior to 2014 or to allow for the possibility of deflation.

**Figure 4-13. Inflation Factor Modification**

**FDA Reformulation Cost Model**

The FDA Reformulation Cost Model provides estimates of the costs of reformulating foods under FDA's jurisdiction. Data on the number of UPCs and formulas are based on 2012 Nielsen scanner data with adjustments for representativeness. Cost data are based on ranges of estimates obtained from industry experts in 2014.

[Load Saved Scenario](#)

**Instructions:**  
Follow each step below to select the model inputs that most closely correspond to the anticipated reformulation in response to regulation.

Step 1: Select product categories, reformulation type, and test types (required)..... [Select by Type](#) [More Info](#)  
[Select by NAICS](#)

Step 2: Select cost assumptions:

a. Wage rates (optional)..... [Modify Wage Rates](#) [More Info](#)

b. Recordkeeping costs (optional)..... Yes [More Info](#)

c. Small company size definition (optional)..... <\$1 MM in sales [More Info](#)

Step 3: Select compliance period (required)..... 12 months [More Info](#)

Step 4: Enter an inflation factor relative to 2014 (0.5 - 10.0) (optional)..... 1.00 [More Info](#)

Step 5: After selecting all inputs..... [Calculate Costs](#) [More Info](#)

Model results will be output to an Excel spreadsheet.

[Reset All Selections](#) [Exit](#)

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#### 4.2.8 Running the Model Using Input Selections

To run the model using the parameters selected in previous steps, select the **Calculate Costs** button on the Main Menu screen.

**Step 8.** Run the model and view the output.

A screen will open asking you to “Save and Run Model” or “Run Model.” By selecting “Save and Run Model,” the parameters that have previously been chosen will be saved in an Excel Workbook named Scenarios.xlsx at the same location as the model on your computer. Otherwise, you may select “Run Model” and not retain the selected inputs.

Once the model run is complete, the output worksheet opens in a new Excel Workbook with the outputs described in Section 4.3.

Note that in future model runs, you can recall a saved scenario to rerun the model as is or modify the input selections prior to rerunning the model.<sup>9</sup> To do this, click the **Load Saved Scenario** button in the upper right of the Main Menu screen in the model. A screen will open with the saved scenarios. Highlight the chosen scenario and click **Load** to populate the inputs in the Main Menu screen.

---

## 4.3 VIEWING THE MODEL OUTPUTS

The results of the model will appear in eight worksheets:

- **Inputs**—presents an overview of selections by the user and a summary of costs. This worksheet allows you to view all input selections for review and to re-create the model if necessary (see Figure 4-14). This worksheet contains the following information:
  - date of run
  - product category
  - percentage of products affected
  - percentage of products reformulated
  - selected type of change
  - selected type of analytical tests, number of samples tested, and costs (if specified by user)
  - selected type of market tests and costs (if specified by user)
  - selected compliance period
  - inclusion of recordkeeping costs
  - selected company size breakpoint
  - inflation factor
  - selected product categories and product subcategories and assumed package types

---

<sup>9</sup> The feature that allows users to save scenarios is still in development.

**Figure 4-14. Model Output—Input Selections Summary**

A	B	C	D	E
1 Reformulation Cost Model				
2 User Inputs - 7/30/2015				
3				
4				
5 <b>Product 1 Selections</b>			<b>Overall Selections</b>	
6 Product Category:	Bagels/biscuits/buns/muffins/rolls - fresh		Compliance Period:	12 months
7 Percent of Products Affected:	100		Recordkeeping Costs:	Yes
8 Percent of Products Reformulated:	100		Small Company Size Definition:	<\$1 MM in sales
9 Ingredient Importance:	Change in production process (& ingredient change)		Price Adjustment Factor:	1
10 Analytical Tests:	NFP (nutrition database)			
11 Other Analytical Test Costs:	0			
12 Consumer Tests:				
13 Small Companies:	Focus group			
14 Medium Companies:	Central location test			
15	Discrimination test			
16 Large Companies:	Central location test			
17	Descriptive test			
18	Discrimination test			
19	In-home test			
20 Other Additional Test Costs:				
21 Small Companies:	0			
22 Medium Companies:	0			
23 Large Companies:	0			
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
<input type="button" value="Inputs"/> <input type="button" value="Affected - Product Category"/> <input type="button" value="Affected Totals by Cost Type"/> <input type="button" value="Affected - All Costs"/> <input type="button" value="Data"/> <input type="button" value="+"/>				

- **Affected-Product Category**—presents detailed cost estimates for each selected product category and product subcategory (not shown because of the size of the table) and the number of UPCs, unique formulas, and units. This worksheet also contains a range of estimated per-UPC cost breakdowns by the following criteria:
  - product categories
  - product subcategories
  - branded versus private-label products
- **Affected Totals by Cost Type**—presents aggregated cost estimates for all selected product categories and

product subcategories (not shown because of the size of the table), delineated by reformulation activity.

- **Affected-All Costs**—presents total and per-formula cost estimates for each selected product category and product subcategory (not shown because of the size of the table), delineated by reformulation activity.
- **Unaffected-Product Category**—presents aggregated cost estimates for each selected product category and product subcategory (not shown because of the size of the table) not affected by the reformulation change.
- **Unaffected Totals by Cost Type**—presents aggregated cost estimates for all selected product category and product subcategory not affected by the reformulation change (not shown because of the size of the table), delineated by reformulation activity.
- **Unaffected-All Costs**—presents total and per-formula cost estimates for each selected product category and product subcategory not affected by the reformulation change (not shown because of the size of the table), delineated by reformulation activity.
- **Data**—includes the data records used to construct the output tables.

Additionally, the output contains a worksheet detailing the data included in the cost estimates. This worksheet is provided for user convenience, should a task require further analyses.

To print the results, click **File**, then select **Print** and then **Print Preview**. You may wish to select **Page Setup** and alter the format of the tables prior to printing.

To save the results, click **File**, then select **Save As...**, choose the file location and name for the output, and click **OK**.

# **Appendix A: Expert Elicitation Methodology**





Appendix A describes the methodology RTI used for conducting the expert elicitation regarding reformulation costs incurred by the food processing industry. We begin with a discussion of the development of the materials for the expert elicitation, list the experts that served on the panel, and describe the process for conducting the expert elicitation.

---

## **A.1 EXPERT ELICITATION MATERIALS**

We prepared the following primary materials for the expert elicitation:

- Recruitment e-mail—used to introduce potential participants to the project and obtain an expression of interest in participating and information on the expert for determining his or her qualifications
- Project description and interest form—provided more detailed information on the expert elicitation process and requested specific information from the experts (see Exhibit A-1)
- Expert elicitation worksheets—completed by the experts to provide responses to expert elicitation questions

In addition to the worksheets, we also prepared an agenda (see Exhibit A-2) and PowerPoint presentation to use during the in-person expert elicitation meeting. The presentation covered the purpose of the panel, a review of the model structure and assumptions, and the definitions and assumptions the experts were to use when answering the worksheets. To offer further guidance, we demonstrated the operation of the previous model that was developed in 2003 (with minor updates completed in 2013).

### **A.1.1 Key Assumptions and Definitions for the Expert Elicitation**

Because of the importance of ensuring that the experts provided responses from a common frame of reference, we provided key assumptions and definitions. We asked experts to consider the manufacturer size categories when responding to questions concerning reformulation by establishment size. Initially, we considered defining size categories by number of employees, but based on the recommendation of the experts, we defined the size categories based on annual sales as follows:

- <\$1 million
- \$1 million to \$499 million
- \$500 million

Because we asked the experts to estimate the number of labor hours spent on each reformulation activity, we provided common labor categories, defined as follows:

- Food Scientists and Technologists (includes research and development, nutritionists)
- Business and Financial Operations (includes office and administrative support)
- Production Occupations
- Management Occupations (includes legal and regulatory staff)

We also reviewed the median wage rates for these labor categories, as defined by the BLS.

We explained the food product categorization used in the model. Food products were grouped by acidity levels and shelf stability and classified as either complex or simple based on the number of ingredients and number of processing steps (as described in Section 2).

In addition, we discussed the typical timeline that food manufacturers need for reformulation activities and if there is an escalation factor that can be applied when reformulation needs to occur in shorter time frames. The time frames discussed were 12 months, 24 months, 36 months, and 48 months.

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## **A.2 PARTICIPANTS ON THE EXPERT ELICITATION PANEL**

The list of experts is provided in Table A-1. All of the experts had general food reformulation and industry knowledge conducive to responding to the questions for the expert elicitation. Differences in their estimates reflect differences in various industry segments (e.g., dairy versus milled foods), geographic differences, and experience with different establishment sizes. Thus, the combined estimates can be thought of as generally representative of industry practices in the United States as a whole.

The experts received an honorarium for their participation and were reimbursed for travel expenses.

**Table A-1. Participants in the Expert Elicitation**

<b>Panelist</b>	<b>Organization</b>	<b>Title</b>
Dr. Bob Brown	Avant Nutrition	Chief Scientific Officer
Dr. William Franke	Rutgers University, Food Innovation Center	Research Professor
Dr. Arun Kilara	Nutri+ Food Business Consultants	Principal
Ms. Sarah Masoni	Oregon State University, The Food Innovation Center	Product Development Manager
Dr. Dan Steffan	A-D Policy Analysis Inc.	Principal—Scientific Regulatory Affairs
Dr. Doris Tancredi	Health & Wellness & Food, LLC	President
Mr. Roger Townley	Townley Associates	President

### **A.3 EXPERT ELICITATION PROCESS**

We conducted the expert panel meeting on May 28 and 29, 2014, at RTI's offices in Research Triangle Park, North Carolina. A few days prior to the meeting, we provided the experts with the agenda, food product category tables, and a copy of the PowerPoint slides for the meeting. The expert elicitation was completed in one round by gaining consensus among the experts during the meeting.

We began the meeting by providing background information on the project and demonstrating the original reformulation model. We reviewed the types of reformulation and the steps, or activities, involved in reformulation. This was followed by a discussion of the types of costs, including capital equipment, labor, utilities, materials, and other costs. After presenting the model assumptions on establishment size, food product categorization, timeline for reformulation, and labor categories, we turned to the worksheets. In determining estimates for the model, the experts agreed on a mean estimate and the assumption that the range of costs would be plus or minus 20% of the mean.

Collectively, the group of experts completed a series of worksheets, as described below:

- Labor Hour Estimates—number of labor hours spent on each reformulation activity and type for each company size and food complexity level

- Labor Type Allocation—percentage of time spent by each labor category for each activity, by company size
- Utilities, Materials, and Other Cost Types—the types of nonlabor costs incurred for each reformulation activity and type
- Utilities, Materials, and Other Cost Estimates—dollars spent on nonlabor costs for each reformulation activity and type, by company size and food complexity level
- Analytical Tests—the types and numbers of analytical tests conducted for each type of reformulation, by company size and food complexity level
- Consumer Tests—the types and numbers of consumer tests conducted for each type of reformulation, by company size and food complexity level

To anchor the estimates, we first determined the cost estimate for the minimum cost scenario (small company, low-complexity food, and substitution of a minor nonfunctional ingredient) and then the maximum cost scenario (large company, high-complexity food, and change in production process with an ingredient change). We then determined the cost estimates between these extremes.

In addition, the experts provided input on the following:

- cost escalation factors for short reformulation timelines by company size
- handling of discarded inventory (ingredients and packaging) due to reformulation
- labor hour assumptions for preparing samples for analytical testing

Following the expert panel meeting, we prepared notes documenting the discussions and compiled the costs into tables for use in the model.

**Exhibit A-1. Project Description and Expert Information Form****Expert Panel on Costs of Food Reformulation: May 28-29, 2014**

Under contract with the Food and Drug Administration, RTI International is updating the FDA Reformulation Cost Model that provides estimates of the costs to the food industry of reformulating food products. The model is being used for estimating the costs of the proposed changes to the Nutrition Facts Panel. RTI is conducting an expert panel meeting to obtain updated estimates of the range of costs for reformulating foods. During the expert panel discussions, we will develop ranges of the capital equipment, labor, utilities, materials, and other costs for the following reformulation activities:

- Determining response to reformulation
- Project management
- Product reformulation and process modification
- Packaging assessment and development
- Product and packaging performance testing
- Sensory evaluation
- Product scale-up

In developing the cost ranges, we will differentiate across types of reformulations, complexity of reformulation for each food category, and size of manufacturer.

To confirm your interest in participating on the expert panel, please complete the expert information form on the following pages and return it to RTI by **April 30, 2014**. *Please also attach your CV or resume.* You will also receive a panel participation agreement from RTI's contracts office to establish the contract for paying your honorarium and travel expenses.

To participate in the panel, we will need for you to do the following:

- travel to RTI's office in Research Triangle Park, NC for a 2-day meeting on May 28 and 29 (arriving the evening of May 27)
- during the meeting, participate in open discussions with the other participants on a set of questions to develop reformulation cost estimates
- based on your experience and knowledge, assist in completing worksheets on the ranges of costs for various reformulation activities for aggregated groups of foods

We are offering an honorarium of \$4,000 for participation on the panel and will reimburse you for reasonable travel expenses. Please note that you will be identified as a participant on the panel, but your specific responses will be combined with those of the other participants in our report to FDA.

**Please return the form and your CV to Michaela Coglaiti (919-990-8498) or [coglaiti@rti.org](mailto:coglaiti@rti.org).** Technical questions regarding this project can be directed to:

**FDA Project Officer**

Dr. Peter Vardon  
5100 Paint Branch Parkway  
College Park, MD 20740  
240-402-1830  
[Peter.Vardon@fda.hhs.gov](mailto:Peter.Vardon@fda.hhs.gov)

**RTI Technical Lead**

Dr. Mary K. Muth  
3040 Cornwallis Road  
Research Triangle Park, NC 27709  
Voice: 919-541-7289  
[muth@rti.org](mailto:muth@rti.org)

**Exhibit A-1. Project Description and Expert Information Form (continued)**

<b>Name</b>	
<b>Preferred Phone</b>	
<b>Preferred Email</b>	
<b>Mailing Address</b>	
<b>Country of Citizenship</b>	

**1. Information on areas of expertise**

Please provide an assessment of your expertise in each food category and establishment size. It is not necessary to demonstrate expertise in all areas.

Food Category	Level of Experience/Knowledge		
	Minimal/None	Moderate	Extensive
Baked goods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baking ingredients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beverages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Breakfast foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Candy & gum	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condiments, Dips, & Spreads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dairy foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Desserts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dressings & Sauces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eggs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Entrees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fats & Oils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fruits & Vegetables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Infant foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pizza	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Seafood (fresh & frozen)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Side dishes & Starches	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snack foods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sweeteners	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Exhibit A-1. Project Description and Expert Information Form (continued)**

Establishment Size	Level of Experience/Knowledge		
	Minimal / None	Moderate	Extensive
Fewer than 20 employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20-99 employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
100-499 employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
500 or more employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**2. Conflict of Interest Information**

Please list only current or in-pipeline projects and other relationships with the following entities. Activities listed below do not necessarily disqualify you from participation. RTI will evaluate your responses for any conflict of interest. All information you provide RTI will be kept strictly confidential.

List of projects/relationship ↓ and funding type ⇨		Grant	Contract
<b>Industries that may be affected by reformulation-related rules and regulations</b>			
1		<input type="checkbox"/>	1
2		<input type="checkbox"/>	2
3		<input type="checkbox"/>	3
4		<input type="checkbox"/>	4
5		<input type="checkbox"/>	5
<b>Organizations or associations representing above industries</b>			
1		<input type="checkbox"/>	1
2		<input type="checkbox"/>	2
3		<input type="checkbox"/>	3
4		<input type="checkbox"/>	4
5		<input type="checkbox"/>	5
<b>Government agencies related to the regulation of food products</b>			
1		<input type="checkbox"/>	<input type="checkbox"/>
2		<input type="checkbox"/>	<input type="checkbox"/>
3		<input type="checkbox"/>	<input type="checkbox"/>
4		<input type="checkbox"/>	<input type="checkbox"/>
5		<input type="checkbox"/>	<input type="checkbox"/>

**Exhibit A-2. Agenda for Expert Panel Meeting**

<b>AGENDA</b>	
<b>Expert Panel on Costs of Food Reformulation</b>	
RTI International, 258 Herbert Bldg, Research Triangle Park, NC	
<b>Day 1—Wednesday, May 28</b>	
8:00 AM	Meet Catherine Viator at hotel lobby
8:15 AM	Arrive at RTI
8:30 AM	Orientation <ul style="list-style-type: none"><li>- Introductions</li><li>- Review agenda and materials in binder</li><li>- Review purpose and goals of expert panel</li><li>- Demonstration of previous FDA Food Reformulation Cost Model</li><li>- Review current model structure:<ul style="list-style-type: none"><li>o Types of reformulations that might occur in response to FDA regulations</li><li>o Activities involved in food reformulation</li><li>o Types of reformulation costs</li><li>o Categorization of operation sizes for estimating reformulation costs</li><li>o Categorization of foods for estimating reformulation costs</li></ul></li></ul>
10:00 AM	Break
10:15 AM	Discuss model assumptions: <ul style="list-style-type: none"><li>- Typical reformulation timeline (with no overtime or rush charges)</li><li>- Cost escalation factors for short compliance periods</li><li>- Ability to coordinate regulatory reformulation with planned reformulation (including upward bound for number of years)</li><li>- Types of equipment changes that may be needed for reformulation</li><li>- Discarded inventory assumptions (ingredients and packaging)</li></ul>
12:00 PM	Catered lunch
12:45 PM	Discuss internal consistency of estimates—costs increase with establishment size, complexity of reformulation, and complexity of product  Estimate labor hours and identify labor categories—by type of reformulation, reformulation activity, complexity of product, and establishment size
2:30 PM	Break



**Exhibit A-2. Agenda for Expert Panel Meeting (continued)**

2:45 PM	Identify and estimate costs for utilities, materials, and other costs—by type of reformulation, reformulation activity, complexity of product, and establishment size
5:00 PM	Adjourn Day 1
5:45 PM	Dinner at Saffron
<b>Day 2—Thursday, May 29</b>	
8:15 AM	Meet Catherine Viator at hotel lobby
8:30 AM	Arrive at RTI
	Review and confirm model assumptions from Day 1
	Review and confirm estimates for labor hours and costs of utilities, materials and other costs from Day 1
10:00 AM	Break
10:15 AM	Identify types and numbers of <u>analytical tests</u> by type of reformulation, complexity of reformulation, and size of establishment
	Identify types and numbers of <u>consumer tests</u> by type of reformulation, complexity of reformulation, and size of establishment
12:00 PM	Catered lunch
12:45 PM	Wrap-up discussion
	Identify possible vendors to confirm cost estimates
	Identify possible manufacturers to participate in validation of the model results
2:30 PM	Adjourn



# **Appendix B: Detailed Information on Nielsen Product Modules Included in Each Model Subcategory**



**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods	Baked goods	Bagels/biscuits/buns/muffins/rolls—fresh	Bakery—bagels—fresh
			Bakery—biscuits—fresh
			Bakery—buns—fresh
			Bakery—muffins—fresh
			Bakery—rolls—fresh
		Bagels/biscuits/buns/muffins/rolls—frozen	Bakery—biscuits/rolls/ muffins—frozen
			Bakery—bagels—frozen
		Baked goods—remaining—fresh	Bakery—remaining—fresh
		Baked goods—remaining—frozen	Bakery—remaining—frozen
		Bread—fresh	Bakery—bread—fresh
		Bread—frozen	Bakery—bread—frozen
		Breeding products	Breeding products
			Croutons
			Matzo meal/mixes
			Stuffing products
		Cakes/doughnuts/sweet rolls—fresh	Bakery—breakfast cakes/ sweet rolls—fresh
			Bakery—cakes—fresh
			Bakery—doughnuts—fresh
		Cakes/doughnuts/sweet rolls—frozen	Bakery—cobbler/dumplings/ strudel—frozen
			Bakery—dessert cakes—frozen

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Baked goods (cont.)	Cakes/doughnuts/sweet rolls—frozen (cont.)	Bakery—doughnuts—frozen
			Bakery—breakfast cakes & sweet rolls—frozen
		Cookies/cones	Cookies
			Ice cream cones & cups
		Crackers	Crackers—cheese
			Crackers—flaked soda
			Crackers—flavored snack
			Crackers—graham
			Crackers—oyster
			Crackers—remaining
			Crackers—sprayed butter
			Crackers—sprayed flake
			Matzo
			Wafers & toast & bread sticks
		Mexican shells/tortillas	Mexican shells
			Mexican tortillas
	Baking ingredients	Baking mixes	Mixes—brownies
			Mixes—cake/layer—10 oz & under
			Mixes—cake/layer—over 10 oz.
			Mixes—cake/specialty—10 oz & under
			Mixes—cake/specialty—over 10 oz.

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Baking ingredients (cont.)	Baking mixes (cont.)	Mixes—hushpuppy
			Mixes—pancake
			Mixes—bread
			Mixes—coffee cake
			Mixes—cookie
			Mixes—dessert—misc.
			Mixes—dumpling & kugel
			Mixes—frosting
			Mixes—gingerbread
			Mixes—muffin
			Mixes—pie crust
			Mixes—rolls & biscuits
		Baking supplies	Baking chips—milk chocolate
			Baking chips other than chocolate
			Baking chocolate
			Baking powder
			Baking soda
			Cake decorations & icing
			Chocolate chips & morsels
			Cocoa
			Coconut
			Confectionery paste

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Baking ingredients (cont.)	Baking supplies (cont.)	Corn/potato starch
			Food coloring
			Frosting ready-to-spread
			Fruit pectins
			Fruit protectors
			Fruit—glazed
			Graham cracker & dessert crumbs
			Pie & pastry shells—prepared
			Yeast—dry
			Yeast—refrigerated
		Bread/cookie/dough products—frozen	Bakery—cookies RTE/cookie dough—frozen
			Dough products—bread—frozen
			Pizza crust—frozen
		Dough products—refrigerated	Dough products—cookies & brownies—refrigerated
			Dough products—biscuits—refrigerated
			Dough products—dinner rolls—refrigerated
			Dough products—remaining—refrigerated
			Dough products—sweet rolls—refrigerated
		Flour/corn meal	Corn meal
			Flour—all purpose—remaining

(continued)



**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Baking ingredients (cont.)	Flour/corn meal (cont.)	Flour—single purpose
			Flour—all purpose—white wheat
	Beverages	Buttermilk—refrigerated	Dairy—buttermilk—refrigerated
		Carbonated beverages—low calorie	Soft drinks—low calorie all rem. carb.
			Soft drinks—low calorie cola diet
			Soft drinks—low calorie lemon/lime diet
			Soft drinks—carbonated all rem. carb.
		Carbonated beverages—regular	Soft drinks—carbonated cola regular
			Soft drinks—carbonated lemon/lime regular
			Cocktail mixes—dry
			Cocktail mixes—liquid
			Cocktail products—bitters & heads
		Coffee—ground	Ground coffee
		Coffee—liquid	Coffee—liquid
		Coffee—soluble	Coffee—soluble
			Coffee—soluble flavored
			Coffee substitutes
		Coffee—whole bean	Whole bean coffee
		Creamers—liquid	Creamers—liquid
		Fruit drinks—frozen	Fruit drinks—orange—frozen
			Fruit drinks & mixes—frozen

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

FDA Type	Model Category	Model Subcategory	Product Module in Nielsen Data
Foods (cont.)	Beverages (cont.)	Fruit drinks—refrigerated	Fruit drinks & juices—cranberry ref.
			Fruit drinks—other container ref.
		Fruit drinks—shelf stable	Fruit drinks & juices—cranberry shelf
			Fruit drinks—canned shelf
			Fruit drinks—other container shelf
		Fruit juice—frozen	Fruit juice—apple—frozen
			Fruit juice—grape—frozen
			Fruit juice—grapefruit—frozen
			Fruit juice—orange—frozen
			Fruit juice—remaining—frozen
			Fruit juice—unconcentrated—frozen
		Fruit juice—refrigerated	Cider ref.
			Fruit juice—apple ref.
			Fruit juice—grape ref.
			Fruit juice—grapefruit—other container ref.
			Fruit juice—lemon/lime ref.
			Fruit juice—orange—other container ref.
			Fruit juice—pineapple ref.
			Fruit juice—nectars ref.
			Fruit juice—remaining ref.

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Beverages (cont.)	Fruit juice—shelf stable	Cider shelf
			Fruit juice—apple shelf
			Fruit juice—grape shelf
			Fruit juice—grapefruit—other container shelf
			Fruit juice—lemon/lime shelf
			Fruit juice—orange—other container shelf
			Fruit juice—pineapple shelf
			Fruit juice—grapefruit—canned shelf
			Fruit juice—nectars shelf
			Fruit juice—orange—canned shelf
			Fruit juice—prune shelf
			Fruit juice—remaining shelf
			Fruit punch bases & syrups
		Fruit punch bases/syrups	
		Fruit punch bases/syrups total	
		Ice	Ice
		Milk—flavored—refrigerated	Dairy—flavored milk—refrigerated
		Milk—refrigerated	Dairy—milk—refrigerated
		Milk—shelf stable	Milk—canned
			Milk—shelf stable
		Milk/creamers—powdered	Creamers—powdered
			Milk—powdered

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Beverages (cont.)	Milk/water—additives	Milk/water additives—sweetened
		Noncarbonated beverages—mixes	Breakfast drinks—powdered
			Soft drinks—powdered
		Shakes/drinks—remaining—nonrefrigerated	Remaining drinks & shakes—nonrefrigerated
		Shakes/drinks/eggnog—refrigerated	Eggnog—fresh & canned
			Remaining drinks & shakes—refrigerated
		Tea—bags/packaged	Tea—bags
			Tea—packaged
		Tea—herbal	Tea—herbal—instant
			Tea—herbal bags
			Tea—herbal packaged
		Tea—instant	Tea—instant
			Tea—mixes
		Tea—liquid	Tea—liquid
		Vegetable juice—shelf stable	Vegetable juice—tomato shelf
			Vegetable juice and drink remaining shelf
		Water—bottled	Water—bottled sparkling/carbonated water
			Water—bottled still/noncarbonated water
		Water—bottled/caloric	Soft drinks—carbonated sparkling/carbonated
			Soft drinks—carbonated still/noncarbonated

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Beverages (cont.)	Water—bottled/low calorie	Soft drinks—low calorie sparkling/carbonated Soft drinks—low calorie still/noncarbonated
		Wine—nonalcoholic	Wine—nonalcoholic shlf
	Breakfast foods	Breakfast bars/pastries/ powders	Breakfast bars Granola & yogurt bars Instant breakfast—powdered Toaster pastries
		Breakfasts—frozen	Frozen/refrigerated breakfasts
		Cereal—hot	Cereal—hot Hominy grits
		Cereal—ready to eat	Cereal—granola & natural types Cereal—ready to eat Wheat germ
		Waffle/pancake/French toast—frozen	Frozen waffles & pancakes & French toast
		Candy—chocolate	Candy—chocolate Candy—chocolate—miniatures Candy—chocolate—special
		Candy—dietetic	Candy—dietetic—chocolate Candy—dietetic—nonchocolate
		Candy—nonchocolate	Breath sweeteners Candy—hard rolled

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Candy & gum (cont.)	Candy—nonchocolate (cont.)	Candy—kits
			Candy—lollipops
			Candy—nonchocolate
			Candy—nonchocolate—miniatures
			Marshmallows
		Gum—low calorie	Gum—bubble—sugar free
			Gum—chewing—sugar free
		Gum—regular	Gum—bubble
			Gum—chewing
	Condiments/dips/spreads	Condiments	Catsup
			Fish & seafood & cocktail sauce
			Mustard
		Dips—refrigerated	Dairy—dip—refrigerated & frozen
		Dips—shelf stable	Dip—canned
			Dip—mixes
		Extracts	Extracts
		Honey	Honey
		Jams/jellies	Jams
			Jelly
			Marmalade
			Preserves

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Condiments/dips/spreads (cont.)	Jams/spreads—remaining	Butter—fruit & honey
			Fruit spreads
			Garlic spreads
		Marinades/tenderizers/MSG	Meat marinades & tenderizers
			Monosodium glutamate & flavor enhancers
			Mayonnaise
		Mayonnaise	Salad dressing—"Miracle Whip" type
			Sandwich spreads—relish type
			Peanut butter
		Peanut butter	Peanut butter
		Pepper	Pepper
		Pickles/olives/relishes	Capers
			Chilies
			Olives—black
			Olives—green
			Peppers
			Pickles—dill
			Pickles—sweet
			Pimentos—canned
			Relishes
			Salt—cooking/edible/ seasoned
			Salt—table
			Salt—canning/pickling/ curing

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Condiments/dips/spreads (cont.)	Salt—substitutes	Salt substitutes
		Sandwich spreads/ horseradish/sauerkraut—refrigerated	Horseradish
			Meat & sandwich spreads—refrigerated
			Sauerkraut—refrigerated
		Seasoning—dry	Seasoning—dry
		Spices/seasonings—remaining	Cooking bags w/seasoning
			Home canning seasonings
			Seasoning—liquid & remaining
			Vegetables—onions—instant
		Spreads—refrigerated	Garlic spreads—refrigerated
			Spreads—remaining
		Butter	Butter
		Cheese—cottage/farmers/ ricotta	Cheese—cottage
			Cheese—farmers
			Cheese—ricotta
	Dairy foods	Cheese—grated/shredded	Cheese—grated
			Cheese—shredded
		Cheese—natural	Cheese—natural—American cheddar
			Cheese—natural—American colby
			Cheese—natural—brick
			Cheese—natural—mozzarella

(continued)



**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Dairy foods (cont.)	Cheese—natural (cont.)	Cheese—natural—remaining
			Cheese—natural—variety pack
			Cheese—natural—muenster
			Cheese—natural—Swiss
		Cheese—processed	Cheese—processed—cream cheese
			Cheese—processed—loaves
			Cheese—processed—snack
			Cheese—processed slices—remaining
			Cheese—processed slices—American
		Cheese—specialty/imported	Cheese—specialty/imported
		Cream—refrigerated	Dairy—cream—refrigerated
		Frozen novelties	Frozen novelties
		Ice cream	Ice cream—bulk
		Ice milk/sherbet/yogurt—frozen	Ice milk and sherbet
			Yogurt—frozen
		Ice pops—unfrozen	Ice pops—unfrozen
		Sour cream	Dairy—potato topping—refrigerated
			Dairy—sour cream—refrigerated & canned
		Whipping cream	Whipping cream
		Yogurt—refrigerated	Yogurt—refrigerated
		Yogurt—shakes/drinks—refrigerated	Yogurt—refrigerated—shakes & drinks

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Desserts	Cheesecake/pies—fresh	Bakery—cheesecake—fresh
			Bakery—pies—fresh
		Cheesecake/pies—frozen	Bakery—pies—frozen
			Bakery—cheesecake—frozen
		Dessert—RTS single serving	Desserts—RTS single servings—canned
		Desserts/toppings—frozen	Frozen cream substitutes
			Frozen desserts
			Toppings—whipped—frozen
		Gelatin/pudding—mixes—diet	Gelatin—diet—mix
			Pudding—diet—mix
		Gelatin/pudding—mixes—sweetened	Gelatin—sweetened—mix
			Pudding—sweetened—mix
		Pudding—refrigerated	Pudding—refrigerated
		Syrups/toppings—shelf stable	Mixes—ice cream
			Pudding—plum—canned
			Pudding/pie filling—canned
			Syrup—chocolate
			Syrup—specialty
	Dressings & sauces	Syrups/toppings—shelf stable (cont.)	Toppings—liquid & dry
			Toppings—mixes
			Toppings—refrigerated
		Toppings—refrigerated	Toppings—refrigerated
		Salad dressing—liquid	Salad dressing—liquid

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Dressings & sauces (cont.)	Salad dressing—reduced/low calorie	Salad dressing—reduced/low calorie
		Salad dressing—refrigerated	Salad dressing—refrigerated
		Salad dressings/toppings—dry	Salad & potato toppings—dry
			Salad dressing mixes—dry
		Sauce—barbecue	Barbecue sauces
		Sauce—Mexican	Mexican sauce
		Sauce—spaghetti/marinara	Sauce mix—spaghetti
			Spaghetti/marinara sauce
		Sauce/gravy—mixes	Egg mixes—dry
			Gravy aids & beef extract
			Gravy mixes—packaged
			Sauce & seasoning mix—remaining
			Sauce & seasoning mix—remaining Mexican
			Sauce mix—cheese
			Sauce mix—meat loaf
			Sauce mix—taco
			Seasoning mix—chili
			Seasoning mix—sloppy joe
		Sauce/gravy/glaze	Chili sauce
			Cooking sauce
			Fondue sauce
			Glazes—fruit

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Dressings & sauces (cont.)	Sauce/gravy/glaze (cont.)	Glazes—meat
			Gravy—canned
			Hot dog sauce
			Hot sauce
			Meat sauce
			Mushroom sauce
			Oriental sauces
			Pizza sauce
			Sauces—dipping
			Sauces—miscellaneous—shelf stable
			Tabasco/pepper sauce
			Worcestershire sauce
			Cooking wine & sherry
			Vinegar
		Vinegar/cooking wine	
	Eggs	Eggs—fresh	Eggs—fresh
		Combination lunches	Combination lunches
	Entrees	Entrees—frozen	Dinners—frozen
			Entrees—Italian—1 food—frozen
			Entrees—Italian—2 food—frozen
			Entrees—meat—1 food—frozen
			Entrees—meat—2 food—frozen
			Entrees—Mexican—1 food—frozen

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Entrees (cont.)	Entrees—frozen (cont.)	Entrees—Mexican—2 food—frozen
			Entrees—multipack—frozen
			Entrees—Oriental—1 food—frozen
			Entrees—Oriental—2 food—frozen
			Entrees—poultry—1 food—frozen
			Entrees—poultry—2 food—frozen
			Entrees—remaining—1 food—frozen
			Entrees—remaining—2 food—frozen
			Entrees—seafood—1 food—frozen
			Entrees—seafood—2 food—frozen
			Meal starters—frozen
			Pot pies—frozen
		Entrees—refrigerated	Chili—refrigerated
			Entrees—refrigerated
			Meal starters—refrigerated
			Pasta—refrigerated
		Prepared foods—canned/ shelf stable	Bread—specialty—canned
			Dumplings—canned
			Entrees/side dishes—shelf stable
			Lasagna—canned
			Macaroni products—shelf stable
			Meal starters—shelf stable

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Entrees (cont.)	Prepared foods—canned/ shelf stable (cont.)	Mexican dinners—canned
			Mexican specialties—remaining
			Mexican—refried beans
			Oriental foods—chow mein—canned
			Oriental foods—misc.
			Pickled vegetables & fruit
			Potato salad—canned
			Ravioli—canned
			Rice—canned
			Spaghetti—canned
			Spreads—hors d'oeuvres
	Fats & oils	Sandwiches—refrigerated/ frozen	Sandwiches—refrigerated/frozen
		Cooking sprays	Cooking sprays
		Lard/shortening	Lard
			Shortening
		Margarine/spreads	Margarine and spreads
	Fruits & vegetables	Oils—olive/salad/cooking	Olive oil
			Salad and cooking oil
		Beans—canned	Vegetables—beans—chili—canned
			Vegetables—beans—garbanzo—canned
			Vegetables—beans—kidney/red—canned

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Fruits & vegetables (cont.)	Beans—canned (cont.)	Vegetables—beans—lima—canned
			Vegetables—beans—pinto—canned
			Vegetables—beans—remaining—canned
			Vegetables—beans—vegetarian—shelf stable
			Vegetables—beans—waxed—canned
			Vegetables—beans—white/northern/navy—can
		Beans/peas/lentils/barley—dry	Barley—dry
			Beans—dry
			Peas & lentils & corn—dry
		Fruit—canned	Tapioca—pure
			Canned fruit—apple sauce
			Canned fruit—apples
			Canned fruit—berries
			Canned fruit—figs
			Canned fruit—fruit mixes & salad fruit
			Canned fruit—grapes
			Canned fruit—oranges
			Canned fruit—peaches—freestone
			Canned fruit—pineapple
			Canned fruit—prunes
			Canned fruit—remaining

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Fruits & vegetables (cont.)	Fruit—canned (cont.)	Canned fruit—apricots
			Canned fruit—cherries
			Canned fruit—fruit cocktail
			Canned fruit—grapefruit
			Canned fruit—peaches—cling
			Canned fruit—pears
			Canned fruit—plums
			Cherries—maraschino
			Cranberries—shelf stable
			Mincemeat—canned
			Pie & pastry filling—canned
			Pumpkin—canned
		Fruit—dried	Dates
			Fruit—dried and snacks
			Prunes—dried
			Raisins
			Fresh apples
		Fruit—fresh	Fresh cranberries
			Fresh fruit—remaining
			Fresh grapefruit
			Fresh kiwi
			Fresh oranges

(continued)



**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Fruits & vegetables (cont.)	Fruit—fresh (cont.)	Fresh strawberries
		Fruit/fruit salad—refrigerated	Fruit salads—refrigerated
			Fruit—refrigerated
		Fruits—frozen	Frozen fruits
		Garlic/herbs—fresh	Fresh garlic
			Fresh herbs
		Leafy greens—fresh	Fresh lettuce
			Fresh spinach
		Potatoes—canned	Vegetables—potatoes—canned
			Vegetables—sweet potatoes & yams—canned
		Potatoes—dehydrated	Vegetables—potatoes—mashed—dehydrated
			Vegetables—potatoes—specialty—dehydrated
		Potatoes—fresh	Fresh potatoes
		Potatoes—frozen	Vegetables—potatoes—frozen/refrigerated
		Tomatoes—canned	Tomato paste
			Tomato puree
			Tomato sauce
			Tomatoes—remaining—canned
			Tomatoes—stewed
			Tomatoes—whole—canned

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Fruits & vegetables (cont.)	Vegetables—canned	Bean sprouts—canned
			Cocktail onions
			Grape leaves—canned
			Mushrooms—shelf stable
			Oriental canned vegetables
			Salad—jelled aspic
			Vegetables—red cabbage—canned
			Vegetables—artichokes—canned
			Vegetables—asparagus—shelf stable
			Vegetables—beans—green—canned
			Vegetables—beets—shelf stable
			Vegetables—carrots—shelf stable
			Vegetables—corn on the cob—canned
			Vegetables—corn—cream style—canned
			Vegetables—corn—whole kernel—canned
			Vegetables—greens—canned
			Vegetables—hominy—canned
			Vegetables—mixed—canned
			Vegetables—okra—canned
			Vegetables—onions—canned
			Vegetables—peas & carrots—canned
			Vegetables—peas—canned

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Fruits & vegetables (cont.)	Vegetables—canned (cont.)	Vegetables—peas—remaining—canned
			Vegetables—remaining—canned
			Vegetables—sauerkraut—shelf stable
			Vegetables—spinach—canned
			Vegetables—squash & rutabagas—canned
			Vegetables—succotash—canned
		Vegetables—fresh	Fresh carrots
			Fresh cauliflower
			Fresh celery
			Fresh mushrooms
			Fresh onions
			Fresh radishes
			Fresh sprouts
			Fresh tomatoes
			Fresh vegetables—remaining
			Vegetables—broccoli—frozen
		Vegetables—frozen	Vegetables—carrots—frozen
			Vegetables—corn—frozen
			Vegetables—corn on the cob—frozen
			Vegetables—lima beans—frozen
			Vegetables—mixed—frozen
			Vegetables—peas—frozen

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Fruits & vegetables (cont.)	Vegetables—frozen (cont.)	Vegetables—remaining—frozen
			Vegetables—green beans—frozen
		Vegetables—precut salad mix—fresh	Precut fresh salad mix
	Infant foods	Baby food	Baby cereal & biscuits
			Baby food—junior
			Baby food—strained
			Baby milk and milk flavoring
		Infant formulas	
		Juices—baby	Baby juice
	Pizza	Pizza—frozen	Pizza—frozen
		Pizza—refrigerated	Pizza—refrigerated
	Seafood	Fish—frozen	Seafood—fish—breaded—frozen
			Seafood—fish—unbreaded—frozen
		Seafood—canned	Anchovy paste
			Clam juice shelf stable
			Seafood—anchovies
			Seafood—oysters—canned
			Seafood—remaining—canned
			Seafood—salmon—canned
			Seafood—sardines—canned
			Seafood—shrimp—canned
			Seafood—clams—canned
			Seafood—crab—canned

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Seafood (cont.)	Seafood—canned (cont.)	Seafood—tuna—shelf stable
		Seafood—refrigerated	Seafood—refrigerated
		Seafood—remaining—frozen	Seafood—crab—unbreaded—frozen
			Seafood—remaining—breaded—frozen
			Seafood—remaining—unbreaded—frozen
		Shrimp—frozen	Seafood—shrimp—breaded—frozen
			Seafood—shrimp—unbreaded—frozen
	Side dishes & starches	Hors d’oeuvres/snacks—frozen	Frozen/refrigerated hors d’oeuvres & snacks
		Pasta/noodles—dry	Oriental noodles
			Pasta—macaroni
			Pasta—noodles & dumplings
			Pasta—spaghetti
		Prepared foods—dry mixes	Dry dinners—pasta
			Dry dinners—remaining
			Dry dinners—rice
			Mexican dinners—dry/kit
			Mixes—ethnic specialties
			Oriental foods—ramen noodles
			Pizza pie and crust mixes
			Rice—mixes
			Corn dogs—frozen/ refrigerated
			Pasta—plain—frozen

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Side dishes & starches (cont.)	Prepared foods—remaining— frozen/refrigerated	Sauces & gravies—frozen/ refrigerated
			Soup—frozen—refrigerated
			Taco filling—frozen/ refrigerated
		Ready-made salads	Gelatin salads—refrigerated
			Remaining—ready-made salads
			Rice—instant
		Rice—instant/packaged	Rice—packaged and bulk
			Vegetables—breaded—frozen
			Vegetables—mushrooms—breaded— frozen
		Vegetables—formulated/ breaded—frozen	Vegetables—onions—breaded—frozen
			Vegetables—in sauce—frozen
			Nuts—cans
	Snack foods	Nuts—cans/jars	Nuts—jars
			Nuts—bags
			Nuts—unshelled
		Nuts—cello wrapped	Popcorn—unpopped
			Popcorn—popped
			Snacks—caramel corn
		Nuts—unshelled	Snacks—caramel corn
			Snacks—health bars & sticks
			Snacks—meat
		Popcorn—unpopped	Snacks—remaining

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Snack foods (cont.)	Snacks—salty	Crackers—sandwich & snack packs
			Rice cakes
			Snacks—corn chips
			Snacks—pork rinds
			Snacks—potato chips
			Snacks—potato sticks
			Snacks—pretzel
			Snacks—puffed cheese
			Snacks—tortilla chips
			Snacks—variety packs
	Soups	Snacks—trail mixes	Trail mixes
		Soup—canned	Soup—canned
		Soup—dry	Bouillon
			Instant meals
			Soup mixes—dry & bases
	Sweeteners	Sugar	Stew mixes—dry
			Sugar—brown
			Sugar—remaining
			Sugar—granulated
			Sugar—powdered
		Sugar—substitutes	Sugar substitutes
		Table syrups/molasses	Molasses

(continued)

**Table B-1. Detailed Nielsen Product Modules by Model Category and Subcategory (continued)**

<b>FDA Type</b>	<b>Model Category</b>	<b>Model Subcategory</b>	<b>Product Module in Nielsen Data</b>
Foods (cont.)	Sweeteners (cont.)	Table syrups/molasses (cont.)	Syrup—berry/fruit type
			Syrup—sorghum & sugar
			Syrup—table



# **Appendix C: Product Category Data Using Alternative Company Size Definition**



**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Baked goods	Bagels/biscuits/buns/muffins/rolls—fresh	311812—Commercial Bakeries	High	3,077	2,220	1,770	8,687	2,819	1,877	1,503	7,609
	Bagels/biscuits/buns/muffins/rolls—frozen	311812—Commercial Bakeries	High	137	145	116	558	132	131	105	517
	Baked goods—remaining—fresh	311812—Commercial Bakeries	High	699	375	52	1,128	621	298	48	968
	Baked goods—remaining—frozen	311812—Commercial Bakeries	High	283	112	59	286	243	97	53	247
	Bread—fresh	311812—Commercial Bakeries	High	5,776	2,654	1,804	9,268	5,233	2,263	1,605	8,236
	Bread—frozen	311812—Commercial Bakeries	High	234	132	62	398	211	126	55	365
	Breading products	311812—Commercial Bakeries	Medium	886	516	421	1,310	820	422	351	943
	Cakes/doughnuts/sweet rolls—fresh	311812—Commercial Bakeries	High	5,442	3,587	1,762	16,399	4,791	2,422	1,340	12,997
	Cakes/doughnuts/sweet rolls—frozen	311813—Frozen Cakes, Pies, & Other Pastries Manufacturing	High	168	87	129	126	154	76	106	111
	Cookies/cones	311821—Cookie & Cracker Manufacturing	Medium	8,845	3,451	2,257	9,054	7,178	2,230	1,599	6,848
	Crackers	311821—Cookie & Cracker Manufacturing	Medium	2,234	816	1,189	2,966	1,994	712	741	2,409
	Mexican shells/tortillas	311830—Tortilla Manufacturing	Medium	1,794	616	529	795	1,423	483	400	625

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Baking ingredients	Baking mixes	311822—Flour Mixes & Dough Mfg from Purchased Flour	Medium	1,593	966	896	1,713	1,393	787	683	1,420
	Baking supplies	311340—Nonchocolate Confectionery Manufacturing	Medium	1,196	1,804	440	1,844	1,016	1,358	329	1,493
	Bread/cookie/dough products—frozen	311822—Flour Mixes & Dough Mfg from Purchased Flour	High	160	67	10	103	153	54	10	94
	Dough products—refrigerated	311822—Flour Mixes & Dough Mfg from Purchased Flour	High	245	92	457	1,990	213	83	347	1,612
	Flour/corn meal	311211—Flour Milling	Low	857	421	216	718	674	299	146	538
Beverages	Buttermilk—refrigerated	311511—Fluid Milk Manufacturing	Low	104	193	190	219	70	139	127	151
	Carbonated beverages—low calorie	312111—Soft Drink Manufacturing	Low	521	425	1,571	1,805	329	259	406	712
	Carbonated beverages—regular	312111—Soft Drink Manufacturing	Low	3,163	1,977	3,232	6,597	2,131	1,061	967	3,278
	Cocktail mixes	312111—Soft Drink Manufacturing	Low	725	471	98	105	617	320	71	80
	Coffee—ground	311920—Coffee & Tea Manufacturing	Low	3,171	1,078	1,110	2,470	3,017	966	917	2,259
	Coffee—liquid	311920—Coffee & Tea Manufacturing	Low	206	158	87	24	186	111	63	19
	Coffee—soluble	311920—Coffee & Tea Manufacturing	Low	298	104	361	655	225	87	237	472

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Beverages (cont.)	Coffee—whole bean	311920—Coffee & Tea Manufacturing	Low	1,446	404	305	794	1,408	362	281	755
	Creamers—liquid	311511—Fluid Milk Manufacturing	High	22	34	323	367	21	27	194	234
	Fruit drinks—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Low	48	92	73	752	46	86	67	703
	Fruit drinks—refrigerated	312111—Soft Drink Manufacturing	Medium	375	367	468	437	305	272	306	319
	Fruit drinks—shelf stable	312111—Soft Drink Manufacturing	Low	2,279	2,056	2,290	4,188	1,964	1,456	1,332	3,003
	Fruit juice—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Low	24	77	52	818	24	74	43	755
	Fruit juice—refrigerated	311421—Fruit & Vegetable Canning	Low	709	474	794	1,315	466	311	475	832
	Fruit juice—shelf stable	311421—Fruit & Vegetable Canning	Low	1,644	1,525	626	3,518	1,238	887	398	2,340
	Fruit punch bases/syrups	311930—Flavoring Syrup & Concentrate Manufacturing	Low	279	48	57	20	235	45	43	16
	Ice	312113—Ice Manufacturing	NA	601	115	43	247	469	58	8	174
	Milk—flavored—refrigerated	311511—Fluid Milk Manufacturing	High	378	589	577	513	256	377	334	321
	Milk—refrigerated	311511—Fluid Milk Manufacturing	Low	1,545	1,913	1,439	4,326	876	754	585	1,956
	Milk—shelf stable	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	Low	121	106	136	487	113	86	70	362

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Beverages (cont.)	Milk/creamers—powdered	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	Medium	69	66	106	1,465	60	48	77	1,120
	Milk/water—additives	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	Medium	527	334	318	753	497	298	230	654
	Noncarbonated beverages—mixes	311999—All Other Miscellaneous Food Manufacturing	Medium	224	366	543	1,501	202	250	311	1,012
	Shakes/drinks—remaining—nonrefrigerated	312111—Soft Drink Manufacturing	High	203	217	246	143	170	123	105	86
	Shakes/drinks/eggnog—refrigerated	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	High	239	359	353	414	189	260	210	286
	Tea—bags/packaged	311920—Coffee & Tea Manufacturing	Low	1,922	814	344	1,095	1,792	672	280	975
	Tea—herbal	311920—Coffee & Tea Manufacturing	Medium	1,515	487	241	199	1,431	435	220	185
	Tea—instant	311920—Coffee & Tea Manufacturing	Medium	143	158	220	747	138	131	166	624
	Tea—liquid	311920—Coffee & Tea Manufacturing	Medium	1,273	1,131	1,130	611	1,113	749	671	439
	Vegetable juice—shelf stable	311421—Fruit & Vegetable Canning	Low	669	194	288	897	500	166	202	677
	Water—bottled	312112—Bottled Water Manufacturing	NA	2,366	900	1,529	3,297	1,649	525	731	1,997
	Water—bottled/caloric	312111—Soft Drink Manufacturing	Low	165	252	220	294	119	135	90	159

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Beverages (cont.)	Water—bottled/low calorie	312111—Soft Drink Manufacturing	Low	220	358	237	1,700	171	262	123	1,159
	Wine—nonalcoholic	312130—Wineries	Low	185	102	21	41	173	67	13	33
Breakfast foods	Breakfast bars/pastries/powders	311340—Nonchocolate Confectionery Manufacturing	Medium	1,046	620	1,660	3,216	835	414	1,001	1,880
	Breakfasts—frozen	311412—Frozen Specialty Food Manufacturing	High	431	353	360	566	406	318	311	512
	Cereal—hot	311230—Breakfast Cereal Manufacturing	Medium	435	406	293	2,199	403	310	190	1,751
	Cereal—ready to eat	311230—Breakfast Cereal Manufacturing	Medium	847	921	1,547	6,331	752	581	686	3,853
	Waffle/pancake/French toast—frozen	311412—Frozen Specialty Food Manufacturing	High	108	200	144	980	98	175	120	854
Candy & gum	Candy—chocolate	311320—Chocolate & Confectionery Mfg from Cacao Beans	Medium	8,940	6,141	4,659	2,220	7,128	4,149	2,394	1,538
	Candy—dietetic	311340—Nonchocolate Confectionery Manufacturing	Medium	886	374	134	122	799	304	94	105
	Candy—nonchocolate	311340—Nonchocolate Confectionery Manufacturing	Medium	14,503	8,054	2,479	6,203	12,274	5,214	1,506	4,707
	Gum—low calorie	311340—Nonchocolate Confectionery Manufacturing	High	200	97	1,141	114	148	60	409	48

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Candy & gum (cont.)	Gum—regular	311340—Nonchocolate Confectionery Manufacturing	Medium	637	401	358	93	548	224	193	65
Condiments/dips/spreads	Condiments	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Low	1,263	555	307	2,451	1,140	467	206	2,092
	Dips—refrigerated	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Medium	655	749	291	877	574	565	192	689
	Dips—shelf stable	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Medium	645	283	196	354	620	251	161	325
	Extracts	311942—Spice & Extract Manufacturing	Medium	785	340	73	549	650	263	57	444
	Honey	311999—All Other Miscellaneous Food Manufacturing	Low	1,729	167	8	727	1,362	131	8	573
	Jams/jellies	311421—Fruit & Vegetable Canning	Low	2,204	498	300	2,719	2,027	417	220	2,408
	Jams/spreads—remaining	311421—Fruit & Vegetable Canning	Low	801	182	197	383	725	161	167	341
	Marinades/tenderizers/msg	311942—Spice & Extract Manufacturing	Low	646	313	185	458	606	285	167	424
	Mayonnaise	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Low	182	226	295	1,043	154	171	155	711

(continued)



**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Condiments/dips/spreads	Peanut butter	311911—Roasted Nuts & Peanut Butter Manufacturing	Low	270	118	299	1,814	236	96	148	1,268
	Pepper	311942—Spice & Extract Manufacturing	NA	906	612	196	847	791	462	143	689
	Pickles/olives/relishes	311421—Fruit & Vegetable Canning	Medium	3,897	3,170	581	5,442	3,440	2,419	449	4,367
	Salt	311942—Spice & Extract Manufacturing	NA	862	512	120	1,074	738	395	92	881
	Salt—substitutes	311942—Spice & Extract Manufacturing	High	6	8	3	0	6	8	3	0
	Sandwich spreads/horseradish/sauerkraut—refrig	311421—Fruit & Vegetable Canning	Medium	382	188	21	204	323	150	14	168
	Seasoning—dry	311942—Spice & Extract Manufacturing	Medium	9,132	4,565	1,612	3,484	8,271	3,795	1,275	3,035
	Spices/seasonings—remaining	311942—Spice & Extract Manufacturing	Medium	480	405	161	355	418	314	109	285
	Spreads—refrigerated	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	High	1,187	444	151	172	1,055	356	109	147
Dairy foods	Butter	311512—Creamery Butter Manufacturing	Low	338	250	125	641	307	215	94	554
	Cheese—cottage/farmers/ricotta	311511—Fluid Milk Manufacturing	Low	288	590	560	1,308	197	374	356	842
	Cheese—grated/shredded	311513—Cheese Manufacturing	Low	716	837	382	3,665	615	638	265	2,877

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Dairy foods (cont.)	Cheese—natural	311513—Cheese Manufacturing	Low	2,152	2,093	682	5,218	1,729	1,472	454	1,936
	Cheese—processed	311513—Cheese Manufacturing	Low	1,390	1,081	406	3,214	1,219	825	232	2,542
	Cheese—specialty/imported	311513—Cheese Manufacturing	Low	1,694	1,598	151	570	1,423	1,122	90	436
	Cream—refrigerated	311511—Fluid Milk Manufacturing	Low	249	351	346	631	181	197	209	392
	Frozen novelties	311520—Ice Cream & Frozen Dessert Manufacturing	High	1,592	1,390	1,464	2,442	1,488	1,257	1,302	2,224
	Ice cream	311520—Ice Cream & Frozen Dessert Manufacturing	Low	2,551	2,343	1,946	6,305	2,278	1,941	1,665	5,422
	Ice milk/ sherbet/ yogurt—frozen	311520—Ice Cream & Frozen Dessert Manufacturing	Low	300	403	269	896	272	347	248	800
	Ice pops—unfrozen	311520—Ice Cream & Frozen Dessert Manufacturing	Low	122	221	14	163	95	122	14	105
	Sour cream	311511—Fluid Milk Manufacturing	Low	228	384	273	842	150	197	130	453
	Whipping cream	311511—Fluid Milk Manufacturing	Low	67	165	160	242	59	95	97	155
	Yogurt—refrigerated	311511—Fluid Milk Manufacturing	Low	874	1,372	1,610	4,849	757	1,143	1,275	3,992
	Yogurt—shakes/ drinks—refrigerated	311511—Fluid Milk Manufacturing	High	311	417	155	199	247	290	120	147
Desserts	Cheesecake/pies—fresh	311812—Commercial Bakeries	High	1,571	1,082	241	3,283	1,150	592	214	2,219

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Desserts (cont.)	Cheesecake/pies—frozen	311813—Frozen Cakes, Pies, & Other Pastries Manufacturing	High	258	57	321	113	214	45	266	94
	Dessert—RTS single serving	311999—All Other Miscellaneous Food Manufacturing	Medium	279	263	332	1,846	256	220	262	1,558
	Desserts/toppings—frozen	311813—Frozen Cakes, Pies, & Other Pastries Manufacturing	High	503	337	227	683	457	303	174	598
	Gelatin/pudding—mixes—diet	311999—All Other Miscellaneous Food Manufacturing	Medium	30	28	53	422	28	20	35	314
	Gelatin/pudding—mixes—sweetened	311999—All Other Miscellaneous Food Manufacturing	Medium	310	260	171	1,223	255	191	122	937
	Pudding—refrigerated	311999—All Other Miscellaneous Food Manufacturing	High	213	151	227	464	168	118	155	346
	Syrups/toppings—shelf stable	311999—All Other Miscellaneous Food Manufacturing	High	496	336	242	354	442	265	200	299
	Toppings—refrigerated	311999—All Other Miscellaneous Food Manufacturing	High	34	75	121	398	29	63	87	308
Dressings & sauces	Salad dressing—liquid	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Low	1,089	888	694	1,926	942	666	468	1,498
	Salad dressing—reduced/low calorie	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	High	260	163	134	243	255	138	115	222

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Dressings & sauces (cont.)	Salad dressing—refrigerated	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	High	384	445	140	140	338	309	108	109
	Salad dressings/toppings—dry	311942—Spice & Extract Manufacturing	Medium	66	166	84	197	62	126	63	156
	Sauce—barbecue	311421—Fruit & Vegetable Canning	Low	1,857	339	169	971	1,632	262	119	826
	Sauce—Mexican	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Medium	1,819	750	389	1,465	1,729	660	284	1,324
	Sauce—spaghetti/marinara	311421—Fruit & Vegetable Canning	Low	1,328	622	375	1,691	1,246	582	322	1,562
	Sauce/gravy—mixes	311942—Spice & Extract Manufacturing	Medium	872	703	484	1,170	805	641	413	1,056
	Sauce/gravy/glaze	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Medium	5,285	1,896	686	2,094	4,919	1,640	559	1,894
	Vinegar/cooking wine	311941—Mayonnaise, Dressing, & Other Prepared Sauce Mfg	Low	1,036	636	88	1,322	851	479	64	1,048
Eggs	Eggs—fresh	311999—All Other Miscellaneous Food Manufacturing	NA	1,606	563	172	1,830	1,299	407	108	1,417
Entrees	Combination lunches	311911—Roasted Nuts & Peanut Butter Manufacturing	High	32	113	164	51	32	95	150	45

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Entrees (cont.)	Entrees—frozen	311412—Frozen Specialty Food Manufacturing	High	3,773	3,531	2,174	2,720	3,503	3,070	2,017	2,465
	Entrees—refrigerated	311991—Perishable Prepared Food Manufacturing	High	2,707	1,371	521	2,932	2,494	1,218	438	2,646
	Prepared foods—canned/shelf stable	311999—All Other Miscellaneous Food Manufacturing	High	3,281	2,659	654	1,659	2,902	2,230	549	1,428
	Sandwiches—refrigerated/frozen	311999—All Other Miscellaneous Food Manufacturing	High	1,453	668	473	1,913	1,347	579	426	1,733
Fats & oils	Cooking sprays	311225—Fats & Oils Refining & Blending	Medium	57	34	70	514	53	33	50	434
	Lard/shortening	311613—Rendering & Meat Byproduct Processing	High	43	70	28	206	32	33	11	111
	Margarine/spreads	311225—Fats & Oils Refining & Blending	High	76	179	193	821	67	137	104	565
	Oils—olive/salad/cooking	311225—Fats & Oils Refining & Blending	Low	2,274	1,109	186	2,766	1,530	535	91	1,670
Fruits & vegetables	Beans—canned	311421—Fruit & Vegetable Canning	Medium	668	900	228	1,885	581	637	158	1,442
	Beans/peas/lentils/barley—dry	311423—Dried & Dehydrated Food Manufacturing	NA	1,574	543	35	1,928	1,240	380	29	1,477
	Fruit—canned	311421—Fruit & Vegetable Canning	Low	1,397	902	460	6,513	1,229	698	309	4,666
	Fruit—dried	311423—Dried & Dehydrated Food Manufacturing	Medium	2,609	1,623	473	2,131	2,166	1,143	356	1,659
	Fruit—fresh	111339—Other Noncitrus Fruit Farming	Low	2,584	2,380	2,130	847	2,099	1,056	824	476

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Fruits & Vegetables	Fruit/fruit salad—refrigerated	311991—Perishable Prepared Food Manufacturing	High	739	1,132	174	908	553	550	109	539
	Fruits—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Medium	362	235	111	1,411	335	211	84	1,253
	Garlic/herbs—fresh	111219—Other Vegetable (except Potato) & Melon Farming	Low	1,191	704	94	277	1,060	514	78	229
	Leafy greens—fresh	111219—Other Vegetable (except Potato) & Melon Farming	Low	132	236	109	68	130	189	67	55
	Potatoes—canned	311421—Fruit & Vegetable Canning	Medium	63	119	17	599	62	92	10	493
	Potatoes—dehydrated	311423—Dried & Dehydrated Food Manufacturing	Medium	153	212	94	757	126	143	64	549
	Potatoes—fresh	111211—Potato Farming	Low	736	426	501	161	595	265	197	101
	Potatoes—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Medium	413	455	284	2,078	374	383	248	1,811
	Tomatoes—canned	311421—Fruit & Vegetable Canning	Low	790	698	374	3,083	725	528	262	2,509
	Vegetables—canned	311421—Fruit & Vegetable Canning	Medium	2,080	1,977	415	6,518	1,851	1,544	277	5,344
	Vegetables—fresh	111219—Other Vegetable (except Potato) & Melon Farming	Low	4,493	3,074	953	1,674	3,854	2,268	521	1,306

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Fruits & vegetables	Vegetables—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	Medium	665	1,407	454	7,876	599	1,116	391	6,559
	Vegetables—precut salad mix—fresh	311991—Perishable Prepared Food Manufacturing	High	104	366	301	422	88	284	241	168
Infant foods	Baby food	311422—Specialty Canning	High	273	629	799	421	252	609	690	383
	Infant formulas	311514—Dry, Condensed, & Evaporated Dairy Product Mfg	High	18	0	356	323	17	0	229	106
	Juices—baby	311421—Fruit & Vegetable Canning	Low	0	30	60	3	0	21	45	1
Meat & poultry	Meat—frozen	311612—Meat Processed from Carcasses	High	549	269	15	307	466	185	14	245
	Meat/poultry—canned	311422—Specialty Canning	Medium	1,050	602	1,089	1,437	900	495	809	578
	Poultry—frozen	311615 - Poultry Processing	High	210	173	76	326	183	139	60	271
Pizza	Pizza—frozen	311412—Frozen Specialty Food Manufacturing	High	1,040	612	707	1,675	942	545	623	1,497
	Pizza—refrigerated	311991—Perishable Prepared Food Manufacturing	High	221	78	6	156	206	61	6	139
Seafood	Fish—frozen	311712—Fresh & Frozen Seafood Processing	High	774	925	66	892	659	739	55	734
	Seafood—canned	311711—Seafood Canning	Medium	1,662	1,779	23	855	1,466	1,370	17	704
	Seafood—refrigerated	311711—Seafood Canning	High	1,137	529	1	187	952	430	1	155

(continued)

**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Seafood (cont.)	Seafood—remaining—frozen	311712—Fresh & Frozen Seafood Processing	High	619	299	0	120	560	270	0	108
	Shrimp—frozen	311712—Fresh & Frozen Seafood Processing	High	1,208	1,455	3	1,279	798	764	3	751
Side dishes & starches	Hors d'oeuvres/snacks—frozen	311412—Frozen Specialty Food Manufacturing	High	1,123	847	276	993	1,029	723	214	870
	Pasta/noodles—dry	311823—Dry Pasta Manufacturing	Medium	3,920	2,395	658	4,865	3,614	2,055	497	4,302
	Prepared foods—dry mixes	311823—Dry Pasta Manufacturing	Medium	958	628	1,187	2,911	913	553	1,027	2,616
	Prepared foods—remaining—frozen/refrigerated	311412—Frozen Specialty Food Manufacturing	High	2,621	918	193	1,544	2,431	765	165	1,389
	Ready-made salads	311991—Perishable Prepared Food Manufacturing	High	1,120	1,189	81	2,446	924	832	71	1,870
	Rice—instant/packaged	311212—Rice Milling	Medium	1,138	441	280	1,503	854	320	150	1,069
	Vegetables—formulated/breaded—frozen	311411—Frozen Fruit, Juice, & Vegetable Manufacturing	High	52	145	157	315	46	116	147	274
Snack foods	Nuts—cans/jars	311911—Roasted Nuts & Peanut Butter Manufacturing	Medium	1,479	1,348	287	3,385	1,301	1,042	174	2,736
	Nuts—cello wrapped	311911—Roasted Nuts & Peanut Butter Manufacturing	Medium	3,600	2,082	720	1,692	3,090	1,546	459	1,346

(continued)



**Table C-1. Product Category Data: Estimated Number of UPCs and Formulas (\$10 MM Sales Small Company Definition), 2012 (continued)**

Model Category	Model Subcategory (i)	6-Digit NAICS	Complexity	Number of UPCs				Number of Formulas			
				Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL	Branded (Small Company)	Branded (Medium Company)	Branded (Large Company)	PL
				UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>B</sup>	UPC <sup>PL</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>B</sup>	FORM <sup>PL</sup>
Snack Foods (cont.)	Nuts—unshelled	311911—Roasted Nuts & Peanut Butter Manufacturing	Low	309	239	48	171	210	119	27	102
	Popcorn—unpopped	311999—All Other Miscellaneous Food Manufacturing	Medium	395	143	404	1,589	323	91	167	979
	Snacks—caramel corn/popped popcorn	311919—Other Snack Food Manufacturing	Medium	1,418	696	269	238	1,152	402	141	171
	Snacks—health bars & sticks	311919—Other Snack Food Manufacturing	High	732	541	666	41	588	252	342	13
	Snacks—meat	311612—Meat Processed from Carcasses	Medium	1,855	1,025	162	363	1,670	818	143	315
	Snacks—remaining	311919—Other Snack Food Manufacturing	Medium	2,897	1,538	1,308	886	2,593	1,271	827	723
	Snacks—salty	311919—Other Snack Food Manufacturing	Medium	5,357	4,758	4,658	5,163	4,364	3,220	2,464	3,506
	Snacks—trail mixes	311919—Other Snack Food Manufacturing	Medium	1,513	860	182	750	1,230	689	129	600
Soups	Soup—canned	311421—Fruit & Vegetable Canning	High	651	627	1,278	4,446	612	537	1,074	3,867
	Soup—dry	311423—Dried & Dehydrated Food Manufacturing	High	1,368	1,114	522	552	1,297	935	431	488
Sweeteners	Sugar	311311—Sugarcane Mills	NA	391	372	28	1,274	346	280	22	1,043
	Sugar—substitutes	325199—All Other Basic Organic Chemical Manufacturing	NA	236	230	18	520	171	146	13	353
	Table syrups/molasses	311999—All Other Miscellaneous Food Manufacturing	Low	1,155	262	203	1,405	867	190	122	1,022